1432

Drinking Water Surveillance Program

CHATHAM WATER TREATMENT PLANT

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CHATHAM
WATER TREATMENT PLANT

DRINKING WATER SURVEILLANCE PROGRAM

ANNUAL REPORT 1989

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EXECUTIVE SUMMARY

DRINKING WATER SURVEILLANCE PROGRAM

CHATHAM WATER TREATMENT PLANT
1989 ANNUAL REPORT

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1989, 65 supplies were being monitored.

The Chatham Water Treatment Plant treats water from Lake Erie using conventional treatment. The process consists of coagulation, flocculation, sedimentation, filtration and disinfection. The Chatham plant has a design capacity of 91 X 1000 M^3/day and supplies a population of approximately 42,000.

Water samples from the plant: raw and treated and two distribution system sites, were taken on a monthly basis and analyzed for the presence of approximately 180 parameters. Parameters were divided into the following groups: Bacteriological, Inorganic and Physical (Laboratory Chemistry, Field Chemistry and Metals) and Organic (Chloroaromatics, Chlorophenols, Pesticides and PCB, Phenolics, Polyaromatic Hydrocarbons, Specific Pesticides and Volatiles). Chlorophenols and Specific Pesticides were analyzed in June and November only.

A summary of results is shown in Table A.

Inorganic and Physical parameters were below any applicable health related Ontario Drinking Water Objectives.

Samples were analyzed monthly for the presence of approximately 110 Organics. Levels did not exceed health related guidelines.

During 1989, the DWSP sampling results indicated that the Chatham Water Treatment Plant produced good quality water at the plant and this quality was maintained in the distribution system.

TABLE A

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP

SUMMARY TABLE BY SCAN

SCAN	RAW TESTS	RAW POSITIVE	RAW %POSITIVE	TREATED TESTS	TREATED POSITIVE	TREATED %POSITIVE	SITE 1 TESTS	SITE 1 POSITIVE	SITE 1 %POSITIVE	SITE 2 TESTS	SITE 2 POSITIVE	SITE 2 %POSITIVE
BACTERIOLOGICAL	36	11	30	36	1	2	27	6	22	36	8	22
CHEMISTRY (FLD)	72	72	100	72	72	100	90	86	95	137	137	100
CHEMISTRY (LAB)	242	198	81	251	180	71	296	252	85	415	342	82
METALS	288	165	57	288	146	50	377	232	61	541	322	59
CHLOROAROMATICS	168	0	0	168	0	0	126	0	0	154	0	0
CHLOROPHENOLS	12	0	0	12	0	0	.	.	.	.	.	.
PAH	190	0	0	190	0	0	.	.	.	.	.	.
PESTICIDES & PCB	408	0	0	408	0	0	254	0	0	322	0	0
PHENOLICS	12	8	66	12	6	50	.	.	.	.	.	.
SPECIFIC PESTICIDES	65	0	0	46	0	0	9	0	0	11	0	0
VOLATILES	348	48	13	319	44	13	261	36	13	319	45	14
TOTAL	1841	502		1802	449		1440	612		1935	854	

NO KNOWN HEALTH RELATED GUIDELINES WERE EXCEEDED.

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE
A '.' INDICATES THAT NO SAMPLE WAS TAKEN

DRINKING WATER SURVEILLANCE PROGRAM

CHATHAM WATER TREATMENT PLANT
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INTRODUCTION

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1989, 65 plants were being monitored. Appendix A carries a fill description of the DWSP.

The DWSP was initiated for the Chatham Water Treatment Plant in December of 1988.

This report contains information and results for 1989.

PLANT DESCRIPTION

The Chatham Water Treatment Plant is a conventional treatment plant that treats water from Lake Erie. A pumping station by Lake Erie chlorinates the raw water and pumps it twelve miles to the treatment plant in Chatham. The process consists of coagulation, flocculation, sedimentation, filtration and disinfection. The Chatham plant has a design capacity of 91.0 X 1000 M^3/day and flows

for day of sampling ranging from 22.1 x 1000 m^3/day to 27.6 x 1000 m^3/day. The plant serves a population of approximately 42,000.

The plant location is shown in Figure 1. Plant process details, in a block schematic, are shown in Figure 2. General plant information is presented in Table 2.

SAMPLING LOCATIONS

Water samples were obtained from four DWSP approved locations;

i) Raw - The water originated from the lowlift pump at the treatment plant after pre-chlorination at the Lake Erie pumping station and was sampled through a stainless steel sample line. The sample tap is located at the lowlift pump. This is not a valid raw water sample.

ii) Treated - The water originated from the highlift discharge after the addition of all treatment chemicals and was sampled through a stainless steel sample line. The sample tap is located at the highlift pumps.

iii) Site 1 - This site is approximately 9.1 kilometres from the plant. Water is sampled through existing copper plumbing. The sample tap is located in the basement laundry room.

iv) Site 2 - This site is approximately 11.5 kilometres from

the plant. Water is sampled through existing copper plumbing. The sample tap is located in the basement laundry room.

SAMPLING AND ANALYSES

Sample lines in the plant were flushed prior to sampling to ensure that the water obtained was indicative of its origin and not residual water standing in the sample line.

At all distribution system locations, two types of samples were obtained: a standing and a free flow. The standing sample consisted of water that had been in the household plumbing and service connection for a minimum of six hours. These samples are used to make an assessment of the amount by which the levels of inorganic compounds and metals may be changed on standing, due to leaching from (or deposition on), the plumbing system. The only analysis carried out on the standing samples therefore, are General Chemistry and Metals. The free flow sample represented fresh water from the distribution main that had been flowing at the sample tap for five minutes before being sampled.

Attempts were made to capture the same block of water at each sampling point by taking the retention time into consideration. The retention time was calculated by dividing the volume of water between the two sampling points by the sample day flow. For

FIGURE 1

DRINKING WATER SURVEILLANCE PROGRAM

SITE LOCATION MAP

CHATHAM WATER TREATMENT PLANT

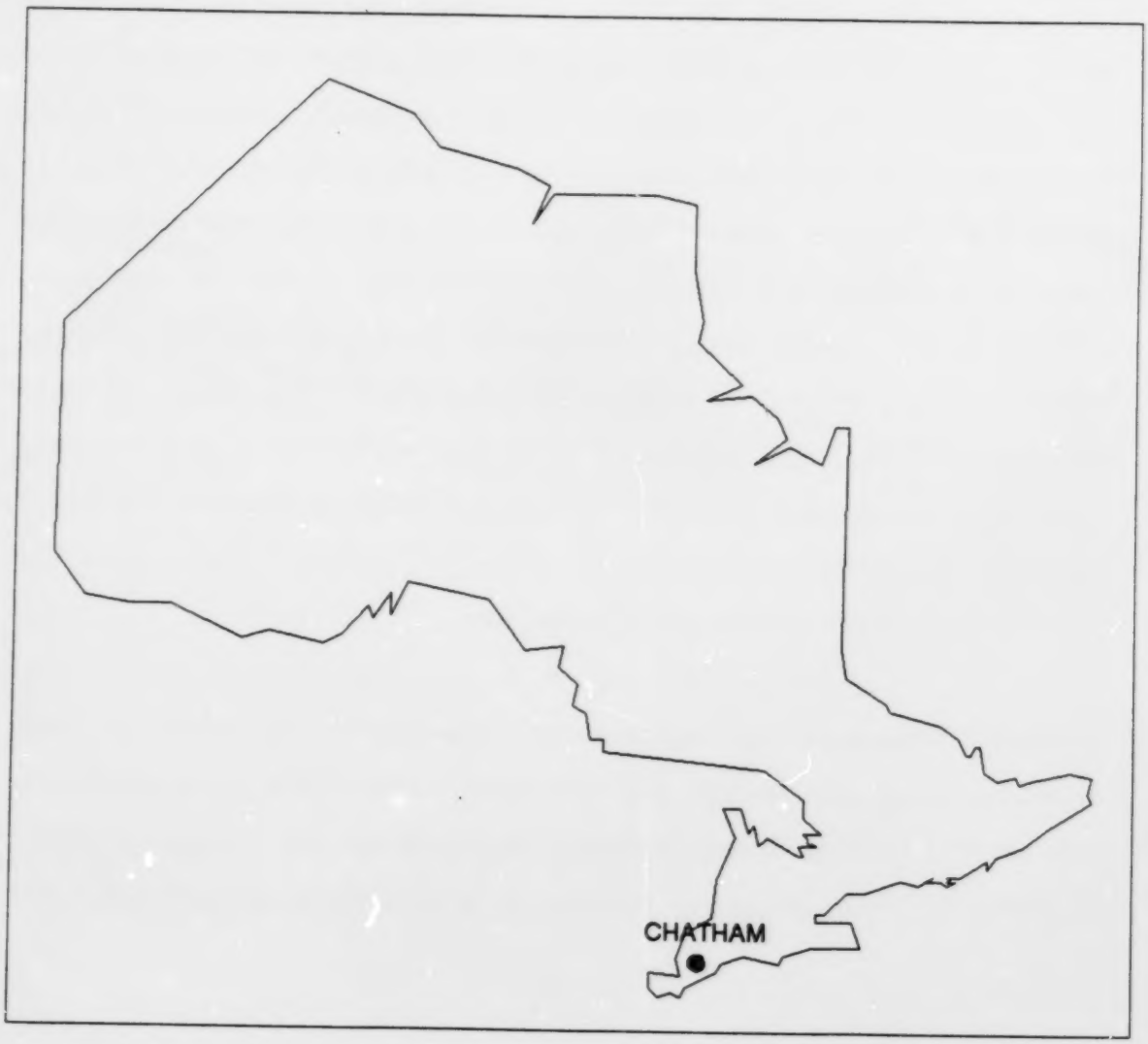

FIGURE 2

CHATHAM WTP

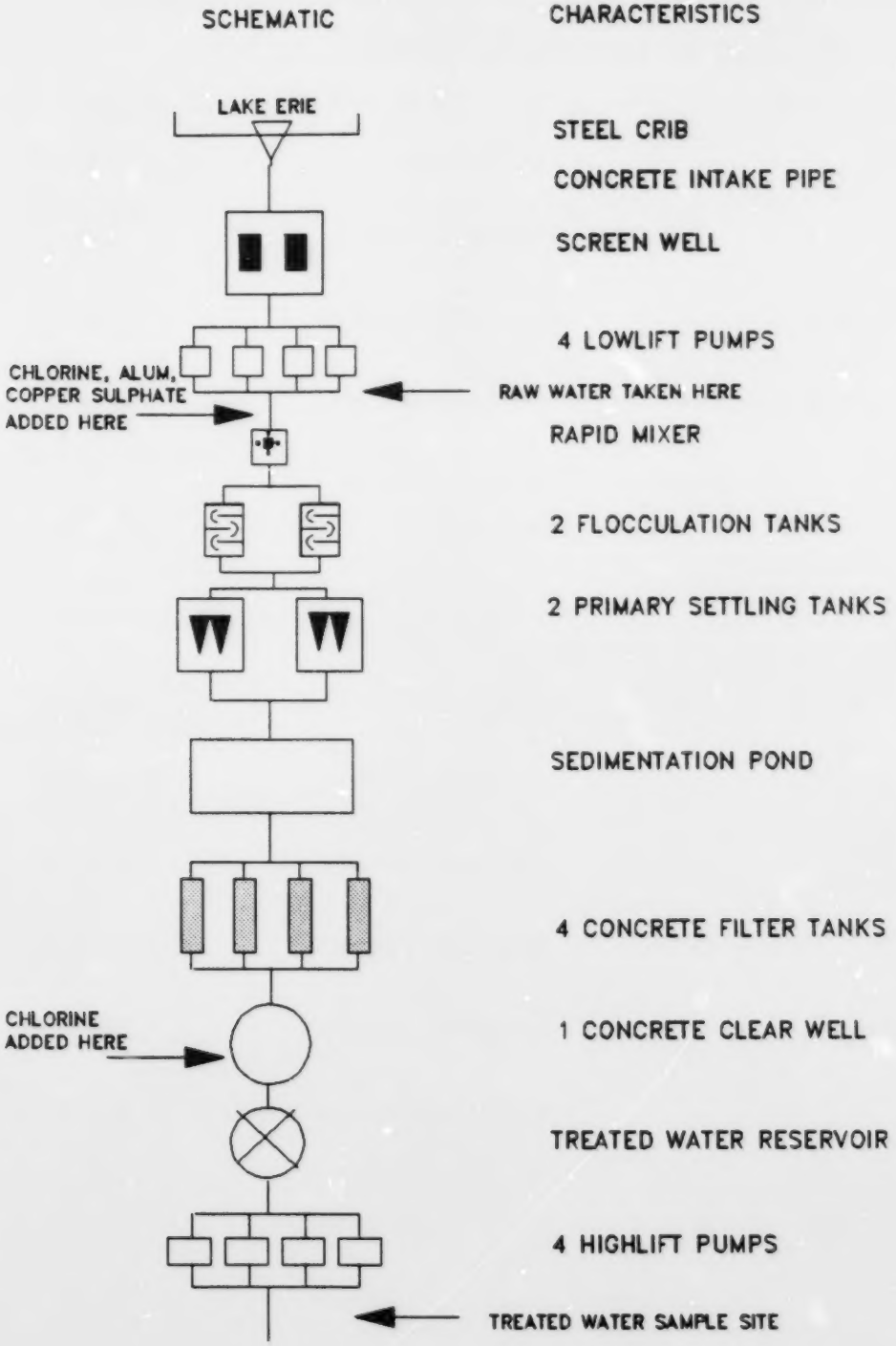

TABLE 1

DRINKING WATER SURVEILLANCE PROGRAM ANNUAL REPORT

IN-PLANT MONITORING CHATHAM WTP 1989

PARAMETER		LOCATION	FREQUENCY
Alkalinity		Treated water	weekly
Aluminum residual		Treated water	weekly
Chlorine residual-free		Treated water	weekly daily
	combined	Treated water	weekly daily
	total	Treated water	weekly daily
Copper		Treated water	weekly
Hardness		Treated water	weekly
Iron		Treated water	weekly
pH		Treated water	weekly
Temperature		Treated water	daily
Turbidity		After main reservoir	daily

TABLE 2

DRINKING WATER SURVEILLANCE PROGRAM ANNUAL REPORT

GENERAL INFORMATION

CHATHAM WATER TREATMENT PLANT

LOCATION:	325 GRAND AVENUE EAST CHATHAM, ONTARIO N7L 1W9 (513-352-5840)
SOURCE:	RAW WATER SOURCE - LAKE ERIE
DESIGN CAPACITY:	91.0 x 1000M^3/DAY
OPERATION:	MUNICIPAL
PLANT SUPERINTENDENT:	K. BANKS
MINISTRY REGION:	SOUTHWEST
DISTRICT OFFICER:	MR. J. DRUMMOND

MUNICIPALITY SERVED	POPULATION
CHATHAM	42,000

example, if it was determined that the retention time within the plant was five hours then there would be a five hour interval between the raw and treated sampling. Similarly, if it was estimated that it took approximately one day for the water to travel from the plant to the distribution system site, this site would be sampled one day after the treated water from the plant.

Stringent DWSP sampling protocols were followed to ensure that all samples were taken in a uniform manner.

Plant operating personnel perform analyses on parameters for process control (Table 1).

The Chatham Water Treatment Plant, raw (after the transmission main from Lake Erie) and treated water and two distribution system locations were sampled for the presence of approximately 180 parameters on a monthly basis beginning in January. The Specific Pesticides and Chlorophenols scans were sampled in June and November only. Polyaromatic Hydrocarbons and Phenolics are only analyzed in the raw and treated water at the plant. As of August, analysis of the triazine pesticides was dropped from the distribution system. Laboratory analysis was conducted at the Ministry of the Environment facilities in Rexdale, Ontario.

RESULTS

Field measurements such as Turbidity, Chlorine Residuals, pH and Temperature were recorded on the day of sampling and were entered onto the DWSP data base as submitted by plant personnel.

Table 3 contains information on the sample day retention time, flow rate and treatment chemicals used and their associated dosages.

Table 4 is a summary break-down of the number of water samples analyzed by parameter and by water type. The number of times that a positive or trace result was detected is also reported.

Positive denotes that the result is greater than the statistical limit of detection established by the Ministry of the Environment (MOE) laboratory staff and is quantifiable. Trace (<T) denotes that the level measured is greater than the lowest value detectable by the method but lies so close to the detection limit that it cannot be confidently quantified.

Table 5 presents the results for parameters detected on at least one occasion.

Table 6 lists all parameters analyzed in the DWSP.

Associated guidelines and detection limits are also supplied on

tables 5 and 6. Parameters are listed alphabetically within each scan.

DISCUSSION

General

Water quality is judged by comparison with the Ontario Drinking Water Objectives (ODWO's) as defined in the 1984 publication (ISBN 0-7743-8985-0). The Province of Ontario has health related and aesthetic objectives for 49 parameters. These are currently under review. When an ODWO is not available, guidelines/limits from other agencies are consulted. The Parameter Listing System (PALIS), recently published (ISBN 0-7729-4461-X) by the MOE, catalogues and keeps current over 1750 guidelines for 650 parameters from agencies throughout the world.

Many of the compounds detected are naturally occurring or are treatment by-products.

Plant operational personnel address occurrences of taste and odour or biological water quality parameters. The DWSP does not assess these aspects of the water supply.

As stated under Results, traces do not indicate quantifiable results as defined by established MOE laboratory analytical reporting protocols. While they can be useful in trend analysis

or confirmation of the presence of a specific contaminant that is repeatedly detected at these levels, the occasional finding of a trace level of a contaminant is not considered to be significant. **DISCUSSION OF GUIDELINES AND LIMITS THEREFORE, IS ONLY CONDUCTED ON POSITIVE RESULTS.**

Bacteriology

Positive results for the Bacteriology scan were present once in the treated water, six times in the Site 1 water and eight times in the Site 2 water. The positive parameters were Standard Plate Count, Total Coliform and/or Total Coliform Background.

Standard Plate Count is a test used to supplement routine analysis for Coliform bacteria. The limit for Standard Plate Count (at 35°C after 48 hours) in the ODWOs is 500 organisms per mL (based on a geometric mean of 5 or more samples). High Standard Plate Counts were present in the September Site 1 water sample and in the June, August and September Site 2 water samples. While no indicators of unsafe water were detected at this time, the high Standard Plate Count may generally be a result of the higher temperatures in the summer months.

Coliform bacteria were detected within 48 hours by the membrane filtration test. The October Site 1 water sample had 3 coliforms/100 mL and the October Site 2 water sample had 1

coliform/100 mL. Standard Plate Count results were low in both samples.

Guidelines for bacteriological sampling and testing of a supply are developed to maintain a proper supervision of its bacteriological quality. The routine monitoring program usually requires the taking of multiple samples in a given system. Full interpretation of bacteriological quality cannot be made on the basis of single samples. Further, bacteriological limits were developed in acknowledgement that the presence of coliforms may be detected due to their non-uniform distribution throughout the distribution system and the fact that their enumeration is subject to considerable variation. For these reasons, the occasional finding of low numbers of coliform organisms is not unexpected. Routine bacteriological monitoring, as outlined in the ODWOs, is carried out by the operating authority.

Inorganic and Physical

Laboratory and Field Chemistry

The results for the Laboratory Chemistry and Field Chemistry scans were below any applicable health related ODWOs.

The ODWO for turbidity of 1 Formazin Turbidity Unit (FTU) was exceeded in the laboratory turbidity result for the July treated water sample. The field turbidity value did not support this.

Protocol for turbidity states that measurements should be made within 48 hours. This is not always achieved except when measured in the field. The field turbidity values are therefore considered more reliable.

It is desirable that the Temperature of drinking water be less than 15°. The palatability of water is enhanced by its coolness. A temperature below 15°C will tend to reduce the growth of nuisance organisms and hence minimize associated taste, colour, odour and corrosion problems. The temperature of the delivered water may increase in the distribution system due to the warming effect of the soil in late summer and fall and/or as a result of higher temperatures in the source water. The desired ODWO was exceeded four times in the treated waters.

The ODWO recommend a hardness level of between 80 and 100 mg/L as calcium carbonate for domestic waters, to provide an acceptable balance between corrosion and encrustation. Water supplies with a hardness greater than 200 mg/L are considered poor and would possess a tendency to form scale deposits and result in excessive soap consumption. The Chatham water had hardness values ranging from 116 mg/L to 138 mg/L.

The Langelier Index is used extensively in estimating the corrosion potential of water. An increasingly negative index indicates the increasing possibility of corrosion. It is considered sound

engineering practice to maintain a slightly positive Langelier Index. The Langelier Index for Chatham is positive with the exception of January.

Metals

The results reported for the Metals scan were below any applicable health related ODWOs.

Iron and Manganese levels were lower in the treated water as compared to the raw water. This is a result of the treatment process. The addition of Alum as a coagulant to the raw water and the resulting coagulation/settling process has been shown to reduce the levels of most metals.

Elevated levels of Copper, Lead, Nickel and Zinc were detected in the standing samples as compared to the free flow distribution samples, indicating that very small quantities of these metals were leached from the household plumbing as the water stood overnight. At Site 1, the Iron and Manganese levels were also elevated in the standing water. Although the Langelier Index indicates minimal potential for corrosion, some metals will be leached in standing samples in most supplies.

At present, there is no evidence that Aluminum is physiologically harmful and no health limit for drinking water has been specified. The measure of residual Aluminum in the treated water is important

to indicate the efficiency of the treatment process. The ODWOs indicate that a useful guideline is to maintain a residual below 100 ug/L as Al in the water leaving the plant to avoid problems in the distribution system. Aluminum values exceeded the ODWO operational guideline in four treated water samples.

Organic Parameters

Chloroaromatics

The results of the Chloroaromatics scan showed that no chloroaromatics were detected.

Chlorophenols

The results of the Chlorophenols scan showed that no Chlorophenols were detected.

The maximum desirable concentration of phenolic substances in drinking water is 2.0 ug/L. This limit has been set primarily to prevent the occurrence of undesirable tastes and odours, particularly in chlorinated water. Phenolics were detected at levels ranging from 0.4 to 11.6 ug/L in the raw water and 0.4 to 2.0 ug/L in the treated water.

Pesticides and PCB (Polychlorinated Biphenyls)

The results of the Pesticides and PCB scan showed that no PCBs were detected and that three pesticides were detected:

Alpha BHC

Lindane

Atrazine

There are several isomers of BHC (Benzene Hexachloride). Gamma BHC is the active ingredient of the pesticide Lindane, while alpha BHC is the isomer predominantly found in surface waters from the Great Lakes Basin as indicated in results from other water supplies on DWSP.

Alpha BHC was detected at trace levels; eight times in the raw water, seven times in the treated water, five times in the Site 1 water and eight times in the Site 2 water.

Lindane was detected at a trace level in one treated water sample.

Atrazine was detected at a trace level; once in the raw water and the treated water.

Specific Pesticides

Results of the Specific Pesticides scan showed that no specific pesticides were detected.

Polynuclear Aromatic Hydrocarbons (PAHs)

The results of the PAH scan showed that no PAHs were detected.

Volatiles

The results of the Volatiles scan showed that eight parameters, other than Trihalomethanes(THMs), were detected:

Benzene

Toluene

Ethylbenzene

M-Xylene

O-Xylene

Styrene

1,1,1 Trichloroethane

Tetrachloroethylene

The detection of benzene, ethylbenzene, toluene and the xylenes at low, trace levels is a laboratory artifact derived from the analytical methodology.

The detected trace levels of Styrene are also considered to be laboratory artifacts resulting from the polystyrene shipping containers. The sporadic background levels from this source are in the order of 0.05 µg/L.

1,1,1 Trichloroethane was detected at trace levels; once in the raw water, the treated water and the Site 2 water.

Tetrachloroethylene (T-chloroethylene) was detected at trace levels; twice in the raw water and once in the Site 2 water.

THMs are acknowledged to be produced during the water treatment process and will always occur in chlorinated surface waters. THMs are comprised of Chloroform, Chlorodibromomethane and Dichlorobromomethane. Bromoform occurs occasionally. Results are reported for the individual compounds as well as for total THMs.

Chloroform, Dichlorobromomethane, Chlorodibromomethane and Total THMs were detected in all water samples. Bromoform was detected at trace levels. All Total THM occurrences, ranging from 6.45 ug/L to 69.4 ug/L, were well below the ODWO of 350 ug/L. Total THMs are present in the raw water as a result of pre-chlorination right at the source.

CONCLUSIONS

The Chatham Water Treatment Plant for the sample year of 1989 produced good quality water at the plant and this quality was maintained in the distribution system.

No health related guidelines, for organic or inorganic parameters, were exceeded during 1989.

RECOMMENDATIONS

One recommendation can be made:

1) The present raw water sample from the treatment plant is chlorinated. The raw water sample should be taken at the Lake Erie pumping station prior to chlorination. The length of the transmission main to the plant could also have an adverse affect on the water quality.

TABLE 3

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP SAMPLE DAY CONDITIONS FOR 1989

	SAMPLE DAY CONDITIONS		TREATMENT CHEMICAL DOSAGES (MG/L)		
			PRE-CHLORINATION	COAGULATION	POST-CHLORINATION
DATE	RETENTION TIME(HRS)	FLOW (1000M3)	CHLORINE	ALUM LIQUID	CHLORINE
JAN 17	21.0	22.4	1.03	8.56	.69
FEB 07	21.0	22.4	.86	10.50	.93
MAR 07	21.0	22.7	.74	8.70	.88
APR 11	19.0	24.9	1.08	11.90	.84
MAY 02	21.0	24.0	1.23	8.18	1.17
JUN 06	21.0	26.2	1.10	8.88	1.00
JUL 05	18.0	24.9	.10	.08	.85
AUG 09	18.0	27.0	.96	7.38	1.38
SEP 06	19.5	27.6	1.13	7.43	1.35
OCT 03	21.5	24.5	.87	7.16	1.41
NOV 07	20.0	23.0	1.56	14.52	1.30
DEC 05	21.0	22.1	1.12	13.80	1.07

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM

SUMMARY TABLE OF RESULTS (1989)

SCAN	PARAMETER	RAW			TREATED			SITE 1			SITE 2		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
BACTERIOLOGICAL	FECAL COLIFORM MF	12	0	0	.	.	.	.	.	.	.	.	.
	STANDRD PLATE CNT MF	.	.	.	12	0	0	9	2	0	12	5	0
	TOTAL COLIFORM MF	12	0	0	12	0	0	9	1	0	12	1	0
	T COLIFORM BCKGRD MF	12	11	0	12	1	0	9	3	0	12	2	0
*TOTAL SCAN BACTERIOLOGICAL		36	11	0	36	1	0	27	6	0	36	8	0
*TOTAL GROUP BACTERIOLOGICAL		36	11	0	36	1	0	27	6	0	36	8	0
CHEMISTRY (FLD)	FLD CHLORINE (COMB)	12	12	0	12	12	0	14	13	0	23	23	0
	FLD CHLORINE FREE	12	12	0	12	12	0	14	12	0	22	22	0
	FLD CHLORINE (TOTAL)	12	12	0	12	12	0	15	14	0	23	23	0
	FLD PH	12	12	0	12	12	0	16	16	0	23	23	0
	FLD TEMPERATURE	12	12	0	12	12	0	15	15	0	23	23	0
	FLD TURBIDITY	12	12	0	12	12	0	16	16	0	23	23	0
*TOTAL SCAN CHEMISTRY (FLD)		72	72	0	72	72	0	90	86	0	137	137	0
CHEMISTRY (LAB)	ALKALINITY	11	11	0	12	12	0	16	16	0	22	22	0
	CALCIUM	12	12	0	12	12	0	16	16	0	23	23	0
	CYANIDE	12	0	0	12	0	0	9	0	0	12	0	0
	CHLORIDE	12	12	0	12	12	0	16	16	0	23	23	0
	COLOUR	11	1	9	12	1	9	16	7	9	23	5	17
	CONDUCTIVITY	11	11	0	12	12	0	16	16	0	22	22	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM

SUMMARY TABLE OF RESULTS (1989)

SCAN	PARAMETER	SITE RAW TOTAL	RAW POSITIVE	RAW TRACE	TREATED TOTAL	TREATED POSITIVE	TREATED TRACE	SITE 1 TOTAL	SITE 1 POSITIVE	SITE 1 TRACE	SITE 2 TOTAL	SITE 2 POSITIVE	SITE 2 TRACE
CHEMISTRY (LAB)	FLUORIDE	12	12	0	12	12	0	16	16	0	23	22	1
	HARDNESS	12	12	0	12	12	0	16	16	0	23	23	0
	IONCAL	12	11	0	12	12	0	16	16	0	23	22	0
	LANGELIERS INDEX	10	10	0	11	10	0	15	15	0	21	21	0
	MAGNESIUM	12	12	0	12	12	0	16	16	0	23	23	0
	SODIUM	12	12	0	12	12	0	16	16	0	23	23	0
	AMMONIUM TOTAL	12	5	2	12	1	5	16	4	6	22	1	11
	NITRITE	12	4	7	12	0	6	16	3	11	22	2	14
	TOTAL NITRATES	12	11	0	12	12	0	16	16	0	22	22	0
	NITROGEN TOT KJELD	11	11	0	12	12	0	16	16	0	22	22	0
	PH	11	11	0	12	12	0	16	16	0	22	22	0
	PHOSPHORUS FIL REACT	12	8	2	12	0	4	.	.	.	.	.	.
	PHOSPHORUS TOTAL	11	10	1	12	0	7	.	.	.	.	.	.
	SULPHATE	11	11	0	12	12	0	16	16	0	22	22	0
	TURBIDITY	11	11	0	12	12	0	16	15	1	22	22	0
*TOTAL SCAN CHEMISTRY (LAB)		242	198	21	251	180	31	296	252	27	415	342	43
METALS	SILVER	12	0	2	12	0	3	16	0	5	23	0	9
	ALUMINUM	12	12	0	12	12	0	16	16	0	23	23	0
	ARSENIC	12	2	10	12	0	12	16	5	11	23	0	23
	BARIUM	12	12	0	12	12	0	16	16	0	23	23	0
	BORON	12	10	2	12	10	2	16	15	1	23	21	2
	BERYLLIUM	12	0	7	12	0	6	16	0	8	23	0	11

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM

SUMMARY TABLE OF RESULTS (1989)

SCAN	PARAMETER	SITE RAW TOTAL	RAW POSITIVE	RAW TRACE	TREATED TOTAL	TREATED POSITIVE	TREATED TRACE	SITE 1 TOTAL	SITE 1 POSITIVE	SITE 1 TRACE	SITE 2 TOTAL	SITE 2 POSITIVE	SITE 2 TRACE
METALS	CADMIUM	12	0	4	12	0	2	16	1	6	23	1	7
	COBALT	12	0	11	12	0	10	16	0	15	23	0	18
	CHROMIUM	12	4	7	12	7	4	16	10	6	23	9	13
	COPPER	12	12	0	12	11	1	16	16	0	23	23	0
	IRON	12	10	2	12	0	12	16	14	2	23	22	1
	MERCURY	12	4	0	12	0	3	9	0	0	12	0	0
	MANGANESE	12	12	0	12	7	5	16	16	0	23	23	0
	MOLYBDENUM	12	12	0	12	12	0	16	16	0	23	23	0
	NICKEL	12	1	10	12	1	10	16	7	8	23	10	10
	LEAD	12	10	2	12	8	4	16	16	0	23	22	1
	ANTIMONY	12	12	0	12	12	0	16	16	0	23	23	0
	SELENIUM	12	0	7	12	1	7	16	0	14	23	0	19
	STRONTIUM	12	12	0	12	12	0	16	16	0	23	23	0
	TITANIUM	12	12	0	12	11	1	16	16	0	23	22	1
	THALLIUM	12	0	4	12	0	4	16	0	4	23	0	6
	URANIUM	12	12	0	12	9	3	16	14	2	23	19	4
	VANADIUM	12	4	8	12	11	1	16	6	10	23	12	11
	ZINC	12	12	0	12	10	2	16	16	0	23	23	0
*TOTAL SCAN METALS		288	165	76	288	146	92	377	232	92	541	322	136
*TOTAL GROUP INORGANIC & PHYSICAL		602	435	97	611	398	123	763	570	119	1093	801	179
CHLOROAROMATICS	HEXACHLOROBUTADIENE	12	0	0	12	0	0	9	0	0	11	0	0
	123 TRICHLOROBENZENE	12	0	0	12	0	0	9	0	0	11	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM

SUMMARY TABLE OF RESULTS (1989)

SCAN	PARAMETER	SITE RAW TOTAL	RAW POSITIVE	RAW TRACE	TREATED TOTAL	TREATED POSITIVE	TREATED TRACE	SITE 1 TOTAL	SITE 1 POSITIVE	SITE 1 TRACE	SITE 2 TOTAL	SITE 2 POSITIVE	SITE 2 TRACE
CHLOROAROMATICS	1234 T-CHLOROBENZENE	12	0	0	12	0	0	9	0	0	11	0	0
	1235 T-CHLOROBENZENE	12	0	0	12	0	0	9	0	0	11	0	0
	124 TRICHLOROBENZENE	12	0	0	12	0	0	9	0	0	11	0	0
	1245 T-CHLOROBENZENE	12	0	0	12	0	0	9	0	0	11	0	0
	135 TRICHLOROBENZENE	12	0	0	12	0	0	9	0	0	11	0	0
	HCB	12	0	0	12	0	0	9	0	0	11	0	0
	HEXACHLOROETHANE	12	0	0	12	0	0	9	0	0	11	0	0
	OCTACHLOROSTYRENE	12	0	0	12	0	0	9	0	0	11	0	0
	PENTACHLOROBENZENE	12	0	0	12	0	0	9	0	0	11	0	0
	236 TRICHLOROTOLUENE	12	0	0	12	0	0	9	0	0	11	0	0
	245 TRICHLOROTOLUENE	12	0	0	12	0	0	9	0	0	11	0	0
	26A TRICHLOROTOLUENE	12	0	0	12	0	0	9	0	0	11	0	0
*TOTAL SCAN CHLOROAROMATICS		168	0	0	168	0	0	126	0	0	154	0	0
CHLOROPHENOLS	234 TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
	2345 T-CHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
	2356 T-CHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
	245-TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
	246-TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
	PENTACHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
*TOTAL SCAN CHLOROPHENOLS		12	0	0	12	0	0	0	0	0	0	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM

SUMMARY TABLE OF RESULTS (1989)

		SITE											
		RAW			TREATED			SITE 1			SITE 2		
SCAN	PARAMETER	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PAH	PHENANTHRENE	12	0	0	12	0	0	.	.	.	.	.	.
	ANTHRACENE	12	0	0	12	0	0	.	.	.	.	.	.
	FLUORANTHENE	12	0	0	12	0	0	.	.	.	.	.	.
	PYRENE	12	0	0	12	0	0	.	.	.	.	.	.
	BENZO(A)ANTHRACENE	12	0	0	12	0	0	.	.	.	.	.	.
	CHRYSENE	12	0	0	12	0	0	.	.	.	.	.	.
	DIMETH. BENZ(A)ANTHR	4	0	0	4	0	0	.	.	.	.	.	.
	BENZO(E) PYRENE	12	0	0	12	0	0	.	.	.	.	.	.
	BENZO(B) FLUORANTHEN	12	0	0	12	0	0	.	.	.	.	.	.
	PERYLENE	12	0	0	12	0	0	.	.	.	.	.	.
	BENZO(K) FLUORANTHEN	12	0	0	12	0	0	.	.	.	.	.	.
	BENZO(A) PYRENE	6	0	0	6	0	0	.	.	.	.	.	.
	BENZO(G,H,I) PERYLEN	12	0	0	12	0	0	.	.	.	.	.	.
	DIBENZO(A,H) ANTHRAC	12	0	0	12	0	0	.	.	.	.	.	.
	INDENO(1,2,3-C,D) PY	12	0	0	12	0	0	.	.	.	.	.	.
	BENZO(B) CHRYSENE	12	0	0	12	0	0	.	.	.	.	.	.
	CORONENE	12	0	0	12	0	0	.	.	.	.	.	.
*TOTAL SCAN PAH		190	0	0	190	0	0	0	0	0	0	0	0
PESTICIDES & PCB	ALDRIN	12	0	0	12	0	0	9	0	0	11	0	0
	ALPHA BHC	12	0	8	12	0	7	9	0	5	11	0	6
	BETA BHC	12	0	0	12	0	0	9	0	0	11	0	0
	LINDANE	12	0	0	12	0	1	9	0	0	11	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM

SUMMARY TABLE OF RESULTS (1989)

SCAN	PARAMETER	SITE RAW TOTAL	RAW POSITIVE	RAW TRACE	TREATED TOTAL	TREATED POSITIVE	TREATED TRACE	SITE 1 TOTAL	SITE 1 POSITIVE	SITE 1 TRACE	SITE 2 TOTAL	SITE 2 POSITIVE	SITE 2 TRACE
PESTICIDES & PCB	ALPHA CHLORDANE	12	0	0	12	0	0	9	0	0	11	0	0
	GAMMA CHLORDANE	12	0	0	12	0	0	9	0	0	11	0	0
	DIELDRIN	12	0	0	12	0	0	9	0	0	11	0	0
	METHOXYCHLOR	12	0	0	12	0	0	9	0	0	11	0	0
	ENDOSULFAN 1	12	0	0	12	0	0	9	0	0	11	0	0
	ENDOSULFAN II	12	0	0	12	0	0	9	0	0	11	0	0
	ENDRIN	12	0	0	12	0	0	9	0	0	11	0	0
	ENDOSULFAN SULPHATE	12	0	0	12	0	0	9	0	0	11	0	0
	HEPTACHLOR EPOXIDE	12	0	0	12	0	0	9	0	0	11	0	0
	HEPTACHLOR	12	0	0	12	0	0	9	0	0	11	0	0
	MIREX	12	0	0	12	0	0	9	0	0	11	0	0
	OXYCHLORDANE	12	0	0	12	0	0	9	0	0	11	0	0
	OPDDT	12	0	0	12	0	0	9	0	0	11	0	0
	PCB	12	0	0	12	0	0	9	0	0	11	0	0
	DDD	12	0	0	12	0	0	9	0	0	11	0	0
	PPDDE	12	0	0	12	0	0	9	0	0	11	0	0
	PPDDT	12	0	0	12	0	0	9	0	0	11	0	0
	AMETRINE	12	0	0	12	0	0	5	0	0	7	0	0
	ATRAZINE	12	0	1	12	0	1	5	0	0	7	0	0
	ATRATONE	12	0	0	12	0	0	5	0	0	7	0	0
	CYANAZINE (BLADEX)	12	0	0	12	0	0	5	0	0	7	0	0
	D-ETHYL ATRAZINE	12	0	0	12	0	0	5	0	0	7	0	0
	D-ETHYL SIMAZINE	12	0	0	12	0	0	5	0	0	7	0	0
	PROMETONE	12	0	0	12	0	0	5	0	0	7	0	0
	PROPAZINE	12	0	0	12	0	0	5	0	0	7	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM

SUMMARY TABLE OF RESULTS (1989)

		SITE											
		RAW			TREATED			SITE 1			SITE 2		
SCAN	PARAMETER	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PESTICIDES & PCB	PROMETRYNE	12	0	0	12	0	0	5	0	0	7	0	0
	METRIBUZIN (SENCOR)	12	0	0	12	0	0	5	0	0	7	0	0
	SIMAZINE	12	0	0	12	0	0	5	0	0	7	0	0
	ALACHLOR (LASSO)	12	0	0	12	0	0	5	0	0	7	0	0
	METOLACHLOR	12	0	0	12	0	0	5	0	0	7	0	0
*TOTAL SCAN PESTICIDES & PCB		408	0	9	408	0	9	254	0	5	322	0	8
PHENOLICS	PHENOLICS	12	8	4	12	6	4	.	.	.	.	.	.
*TOTAL SCAN PHENOLICS		12	8	4	12	6	4	0	0	0	0	0	0
SPECIFIC PESTICIDES	TOXAPHENE	12	0	0	12	0	0	9	0	0	11	0	0
	2,4,5-T	2	0	0	2	0	0	.	.	.	.	.	.
	2,4-D	2	0	0	2	0	0	.	.	.	.	.	.
	2,4-DB	2	0	0	2	0	0	.	.	.	.	.	.
	2,4 D PROPIONIC ACID	2	0	0	2	0	0	.	.	.	.	.	.
	DICAMBA	2	0	0	2	0	0	.	.	.	.	.	.
	PICHLORAM	0	0	0	0	0	0	.	.	.	.	.	.
	SILVEX	2	0	0	2	0	0	.	.	.	.	.	.
	DIAZINON	2	0	0	1	0	0	.	.	.	.	.	.
	DICHLOROVOS	2	0	0	1	0	0	.	.	.	.	.	.
	CHLORPYRIFOS	2	0	0	1	0	0	.	.	.	.	.	.

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM

SUMMARY TABLE OF RESULTS (1989)

SCAN	PARAMETER	SITE RAW TOTAL	RAW POSITIVE	RAW TRACE	TREATED TOTAL	TREATED POSITIVE	TREATED TRACE	SITE 1 TOTAL	SITE 1 POSITIVE	SITE 1 TRACE	SITE 2 TOTAL	SITE 2 POSITIVE	SITE 2 TRACE
SPECIFIC PESTICIDES	ETHION	2	0	0	1	0	0	.	.	.	.	.	.
	AZINPHOS-METHYL	0	0	0	0	0	0	.	.	.	.	.	.
	MALATHION	2	0	0	1	0	0	.	.	.	.	.	.
	MEVINPHOS	2	0	0	1	0	0	.	.	.	.	.	.
	METHYL PARATHION	2	0	0	1	0	0	.	.	.	.	.	.
	METHYLTRITHION	2	0	0	1	0	0	.	.	.	.	.	.
	PARATHION	2	0	0	1	0	0	.	.	.	.	.	.
	PHORATE	2	0	0	1	0	0	.	.	.	.	.	.
	RELDAN	2	0	0	1	0	0	.	.	.	.	.	.
	RONNEL	2	0	0	1	0	0	.	.	.	.	.	.
	AMINOCARB	1	0	0	1	0	0	.	.	.	.	.	.
	BENOMYL	1	0	0	1	0	0	.	.	.	.	.	.
	BUX	0	0	0	0	0	0	.	.	.	.	.	.
	CARBOFURAN	2	0	0	1	0	0	.	.	.	.	.	.
	CICP	2	0	0	1	0	0	.	.	.	.	.	.
	DIALLATE	2	0	0	1	0	0	.	.	.	.	.	.
	EPTAM	1	0	0	1	0	0	.	.	.	.	.	.
	IPC	2	0	0	1	0	0	.	.	.	.	.	.
	PROPOXUR	2	0	0	1	0	0	.	.	.	.	.	.
	CARBARYL	2	0	0	1	0	0	.	.	.	.	.	.
	BUTYLATE	2	0	0	1	0	0	.	.	.	.	.	.
*TOTAL SCAN SPECIFIC PESTICIDES		65	0	0	46	0	0	9	0	0	11	0	0
VOLATILES	BENZENE	12	0	0	11	0	1	9	0	0	11	0	2

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM

SUMMARY TABLE OF RESULTS (1989)

		SITE											
		RAW			TREATED			SITE 1			SITE 2		
SCAN	PARAMETER	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
VOLATILES	TOLUENE	12	0	7	11	0	6	9	0	3	11	0	4
	ETHYLBENZENE	12	0	6	11	0	7	9	0	5	11	0	6
	P-XYLENE	12	0	0	11	0	0	9	0	0	11	0	0
	M-XYLENE	12	0	5	11	0	1	9	0	2	11	0	2
	O-XYLENE	12	0	5	11	0	4	9	0	3	11	0	3
	STYRENE	12	0	8	11	0	1	9	0	7	11	0	8
	1,1 DICHLOROETHYLENE	12	0	0	11	0	0	9	0	0	11	0	0
	METHYLENE CHLORIDE	12	0	0	11	0	0	9	0	0	11	0	0
	T1,2DICHLOROETHYLENE	12	0	0	11	0	0	9	0	0	11	0	0
	1,1 DICHLOROETHANE	12	0	0	11	0	0	9	0	0	11	0	0
	CHLOROFORM	12	12	0	11	11	0	9	9	0	11	11	0
	111, TRICHLOROETHANE	12	0	1	11	0	1	9	0	0	11	0	1
	1,2 DICHLOROETHANE	12	0	0	11	0	0	9	0	0	11	0	0
	CARBON TETRACHLORIDE	12	0	0	11	0	0	9	0	0	11	0	0
	1,2 DICHLOROPROPANE	12	0	0	11	0	0	9	0	0	11	0	0
	TRICHLOROETHYLENE	12	0	0	11	0	0	9	0	0	11	0	0
	DICHLOROBROMOMETHANE	12	12	0	11	11	0	9	9	0	11	11	0
	112 TRICHLOROETHANE	12	0	0	11	0	0	9	0	0	11	0	0
	CHLORODIBROMOMETHANE	12	12	0	11	11	0	9	9	0	11	11	0
	T-CHLOROETHYLENE	12	0	0	11	0	2	9	0	0	11	0	1
	BROMOFORM	12	0	10	11	0	10	9	0	9	11	1	10
	1122 T-CHLOROETHANE	12	0	0	11	0	0	9	0	0	11	0	0
	CHLOROBENZENE	12	0	0	11	0	0	9	0	0	11	0	0
	1,4 DICHLOROBENZENE	12	0	0	11	0	0	9	0	0	11	0	0
	1,3 DICHLOROBENZENE	12	0	0	11	0	0	9	0	0	11	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM

SUMMARY TABLE OF RESULTS (1989)

SCAN	PARAMETER	SITE RAW TOTAL	RAW POSITIVE	RAW TRACE	TREATED TOTAL	TREATED POSITIVE	TREATED TRACE	SITE 1 TOTAL	SITE 1 POSITIVE	SITE 1 TRACE	SITE 2 TOTAL	SITE 2 POSITIVE	SITE 2 TRACE
VOLATILES	1,2 DICHLOROBENZENE	12	0	0	11	0	0	9	0	0	11	0	0
	ETHLYENE DIBROMIDE	12	0	0	11	0	0	9	0	0	11	0	0
	TOTL TRIHALOMETHANES	12	12	0	11	11	0	9	9	0	11	11	0
*TOTAL SCAN VOLATILES		348	48	42	319	44	33	261	36	29	319	45	37
*TOTAL GROUP ORGANIC		1203	56	55	1155	50	46	650	36	34	806	45	45
TOTAL		1841	502	152	1802	449	169	1440	612	153	1935	854	224

KEY TO TABLE 5 and 6

A ONTARIO DRINKING WATER OBJECTIVES (ODWO)
1. Maximum Acceptable Concentration (MAC)
1+. MAC for Total Trihalomethanes
1*. MAC for Bacteriological Analyses
Poor water quality is indicated when :
- total coliform counts > 0 < 5
- P/A Bottle Test is present after 48 hours
- Aeromonas organisms are detected in more than 25% of samples in a single submission or in successive submissions from the same sampling site
- Pseudomonas Aeruginosa, Staphylococcus Aureus and members of the Fecal Streptococcus group should not be detected in any sample
- Standard Plate Count should not exceed 500 organisms per ml at 35 ^{0}C within 48 hours

2. Interim Maximum Acceptable Concentration (IMAC)
3. Maximum Desirable Concentration (MDC)
4. Aesthetic or Recommended Operational Guideline
- hardness levels between 80 and 100 mg/L as calcium carbonate are considered to provide an acceptable balance between corrosion and incrustation, water supplies with a hardness >200 mg/L are considered poor and those in excess of 500 mg/L are unacceptable.

B HEALTH & WELFARE CANADA (H&W)
1. Maximum Acceptable Concentration (MAC)
2. Proposed MAC
3. Interim MAC
4. Aesthetic Objective (AO) (for xylenes, a total)

C WORLD HEALTH ORGANIZATION (WHO)
1. Guideline Value (GV)
2. Tentative GV
3. Aesthetic GV

D US ENVIRONMENTAL PROTECTION AGENCY (EPA)
1. Maximum Contaminant Level (MCL)
2. Suggested No-Adverse Effect Level (SNAEL)
3. Lifetime Health Advisory
4. EPA Ambient Water Quality Criteria
5. Maximum Contaminant Level Goal (MCLG)

F EUROPEAN ECONOMIC COMMUNITY (EEC)
1. Health Related Guideline Level
2. Aesthetic Guideline Level
3. Maximum Admissable Concentration (MADC)

G CALIFORNIA STATE DEPARTMENT OF HEALTH-GUIDELINE VALUE

H USSR MAXIMUM PERMISSIBLE CONCENTRATION

I NEW YORK STATE AMBIENT WATER GUIDELINE

N/A NONE AVAILABLE

INTERPRETATION OF DATA

The interpretation of analytical results that are obtained from measurements near the limit of detection of the measurement process is subject to greater uncertainty than those at higher concentrations. The principle areas of concern relate to whether the substance has actually been detected, whether it has been properly identified, and whether it is an artifact of the measurement process. In other words, false positives can be caused by the instrumentation or the test procedures used, when in fact these compounds are not present in the sample.

There are several methods to treat data from such measurements:
1. Exclude the low-level data because of this uncertainty factor. Studies of long-term environmental trends and modelling may however, be adversely affected by the exclusion of such data.
2. Qualify these data so the user is aware of the greater uncertainty associated with their use.

For the Drinking Water Surveillance Program, measurements near the limit of detection of the measurement process are reported with the code "<T". Results qualified by "W" indicate a zero measurement. These results are reported for purposes of modelling and long-term trend analysis and no significance should be attributed to a single determination of a substance below "T" (a single determination may well be a false positive). Repeat analysis or additional data are needed before it can be stated with certainty that the substance in question was truly present. On the other hand, it is less likely that repeated detection of a substance at or near the limit of detection at a specific location is solely due to an artifact in the measurement system, and more likely represents a true positive. The average of such data however, is still only an estimate of the amount of substance present subject to the possible biases of the method used.

LABORATORY RESULTS, REMARK DESCRIPTIONS

.	No Sample Taken
BDL	Below Minimum Measurable Amount
<T	Greater Than Detection Limit But Not Confident (SEE INTERPRETATION OF RESULTS ABOVE)
>	Results Are Greater Than The Upper Limit
<=>	Approximate Result
!CS	No Data: Contamination Suspected
!IL	No Data: Sample Incorrectly Labelled
!IS	No Data: Insufficient Sample
!IV	No Data: Inverted Septum
!LA	No Data: Laboratory Accident
!LD	No Data: Test Queued After Sample Discarded

!LD	No Data: Test Queued After Sample Discarded
!NA	No Data: No Authorization To Perform Reanalysis
!NP	No Data: No Procedure
!NR	No Data: Sample Not Received
!OP	No Data: Obscured Plate
!QU	No Data: Quality Control Unacceptable
!PE	No Data: Procedural Error - Sample Discarded
!PH	No Data: Sample pH Outside Valid Range
!RE	No Data: Received Empty
!RO	No Data: See Attached Report (no numeric results)
!SM	No Data: Sample Missing
!SS	No Data: Send Separate Sample Properly Preserved
!UI	No Data: Indeterminant Interference
!TX	No Data: Time Expired
A3C	Approximate, Total Count Exceeded 300 Colonies
APL	Additional Peak, Large, Not Priority Pollutant
APS	Additional Peak, Less Than, Not Priority Pollutant
CIC	Possible Contamination, Improper Cap
CRO	Calculated Result Only
PPS	Test Performed On Preserved Sample
RMP	P and M-Xylene Not Separated
RRV	Rerun Verification
RVU	Reported Value Unusual
SPS	Several Peaks, Small, Not Priority Pollutant
UAL	Unreliable: Sample Age Exceeds Normal Limit
UCR	Unreliable: Could Not Confirm By Reanalysis
UCS	Unreliable: Contamination Suspected
UIN	Unreliable: Indeterminant Interference
XP	Positive After X Number of Hours
T# (T06)	Result Taken After # Hours

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
	BACTERIOLOGICAL					
FECAL COLIFORM MF (CT/100ML)			DET'N LIMIT = 0		GUIDELINE = 0 (A1)	
JAN	0 T48	.	.	.	.	.
FEB	0 T48	.	.	.	.	.
MAR	0 T48	.	.	.	.	.
APR	0 T48	.	.	.	.	.
MAY	0	.	.	.	.	.
JUN	0	.	.	.	.	.
JUL	0	.	.	.	.	.
AUG	0	.	.	.	.	.
SEP	0	.	.	.	.	.
OCT	0	.	.	.	.	.
NOV	0	.	.	.	.	.
DEC	BDL	.	.	.	.	.
STANDRD PLATE CNT MF ( )			DET'N LIMIT = 0		GUIDELINE = 500/ML (A1)	
JAN	.	8 <=>	.	2 <=>	.	0 <=>
FEB	.	0 <=>	.	0 <=>	.	2 <=>
MAR	.	1 <=>	.	.	.	2 <=>
APR	.	0 <=>	.	0 <=>	.	6 <=>
MAY	.	0 <=>	.	6 <=>	.	3 <=>
JUN	.	3 <=>	.	8 <=>	.	660
JUL	.	0 <=>	.	.	.	235
AUG	.	1 <=>	.	96	.	2400
SEP	.	0 <=>	.	2180	.	22000
OCT	.	0 <=>	.	20 <=>	.	10 <=>
NOV	.	5 <=>	.	8 <=>	.	360
DEC	.	0 <=>	.	.	.	3 <=>
TOTAL COLIFORM MF (CT/100ML)			DET'N LIMIT = 0		GUIDELINE = 5/100ML(A1)	
JAN	BDL	0 T24	.	0 T24	.	0 T24
FEB	BDL	0 T48	.	0 T24	.	0 T24
MAR	BDL	0 T24	.	.	.	0 T24
APR	BDL	0 T24	.	0 T24	.	0 T24
MAY	BDL	0	.	0	.	0
JUN	BDL	0	.	0	.	0
JUL	BDL	0	.	.	.	0
AUG	BDL	0	.	0	.	0
SEP	BDL	0	.	0	.	0
OCT	BDL	0	.	3	.	1
NOV	BDL	0	.	0	.	0
DEC	BDL	0	.	.	.	0
T COLIFORM BCKGRD MF (CT/100ML)			DET'N LIMIT = 0		GUIDELINE = N/A	
JAN	BDL	0 T24	.	7 T24	.	0 T24
FEB	42 T48	0 T48	.	0 T24	.	0 T24
MAR	182 T48	0 T24	.	.	.	0 T24

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
APR	48000 >	0 T24	.	0 T24	.	0 T24
MAY	4800 >	0	.	54	.	0
JUN	4800 >	0	.	0	.	0
JUL	48000 >	1	.	.	.	0
AUG	40000 >	0	.	0	.	0
SEP	42000 A3C	0	.	0	.	3
OCT	9000 A3C	0	.	1	.	8
NOV	1360 A3C	0	.	0	.	0
DEC	58000 A3C	0	.	.	.	0

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHEMISTRY (FLD)						
FLD CHLORINE (COMB) (MG/L)			**DET'N LIMIT = N/A**		**GUIDELINE = N/A**	
JAN	.050	.200	.	.100	<.200	<.200
FEB	.200	.200	.	.100	.100	<.100
MAR	.200	.400	.	.	<.200	<.200
APR	.100	.200	.050	.150	<.100	<.200
MAY	.200	.250	.050	.100	<.100	<.200
JUN	.100	.200	.100	.100	.100	<.200
JUL	.100	.200	.	.	.100	<.200
AUG	.100	.300	.000	.050	<.100	.100
SEP	.100	.100	.030	.050	<.100	.100
OCT	.100	.400	.	.050	.200	<.200
NOV	.050	.200	.	.100	.100	<.200
DEC	.100	.200	.	.	.	<.100
FLD CHLORINE FREE (MG/L)			**DET'N LIMIT = N/A**		**GUIDELINE = N/A**	
JAN	.350	.600	.	.300	.100	<.300
FEB	.100	.800	.	.300	<.100	<.200
MAR	.200	.500	.	.	<.300	<.300
APR	.300	.700	.100	.200	<.100	<.100
MAY	.300	.750	<.050	.300	.	.100
JUN	.100	.600	.100	.100	.100	.100
JUL	.100	.600	.	.	.100	<.100
AUG	.200	.500	.000	.050	.100	<.100
SEP	.100	.750	.000	.020	.100	<.100
OCT	.050	.500	.	.050	.100	<.100
NOV	.050	.900	.	.050	.100	.100
DEC	.050	.800	.	.	.	<.300
FLD CHLORINE (TOTAL) (MG/L)			**DET'N LIMIT = N/A**		**GUIDELINE = N/A**	
JAN	.400	.800	.	.400	.300	.500
FEB	.300	1.000	.100	.400	.200	.300
MAR	.400	.900	.	.	.500	.500
APR	.400	.900	.150	.350	.200	.300
MAY	.500	1.000	<.100	.400	.100	.300
JUN	.200	.800	.200	.200	.200	.300
JUL	.200	.800	.	.	.200	.300
AUG	.300	.800	.000	.100	.200	.200
SEP	.200	.850	.030	.070	.200	.200
OCT	.150	.900	.	1.000	.300	.300
NOV	.100	1.100	.	.150	.200	.300
DEC	.150	1.000	.	.	.	.400
FLD PH (DMNSLESS)			**DET'N LIMIT = N/A**		**GUIDELINE = 6.5-8.5(A4)**	
JAN	7.500	7.200	7.600	7.400	7.400	7.400
FEB	7.600	7.000	7.400	7.400	7.600	7.400
MAR	7.400	7.400	.	.	7.500	7.500

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
APR	7.400	7.200	7.400	7.500	7.400	7.400
MAY	7.500	7.500	7.500	7.500	7.600	7.600
JUN	7.400	7.400	7.500	7.500	7.400	7.600
JUL	7.500	7.600	.	.	7.500	7.600
AUG	7.400	7.600	7.600	7.600	7.600	7.600
SEP	7.600	7.600	7.700	7.700	7.600	7.600
OCT	7.600	7.500	.	7.600	7.600	7.600
NOV	7.600	7.600	.	7.500	7.500	7.600
DEC	7.600	7.500	.	.	.	7.600
FLD TEMPERATURE (DEG.C)			DET'N LIMIT = N/A		GUIDELINE = 15 (A1)	
JAN	1.000	3.000	11.000	5.500	15.000	9.000
FEB	5.000	2.000	7.000	5.000	15.000	7.000
MAR	5.000	4.000	.	.	9.000	5.000
APR	7.000	6.000	9.000	6.500	12.000	8.000
MAY	9.000	8.000	10.500	9.000	19.000	10.000
JUN	8.000	10.500	15.500	13.500	15.000	14.000
JUL	16.500	18.000	.	.	18.000	17.000
AUG	18.000	19.000	20.000	20.000	20.000	19.000
SEP	21.000	20.000	21.000	20.000	22.000	20.000
OCT	18.000	17.000	.	.	20.000	19.000
NOV	12.000	12.000	.	14.000	18.000	15.000
DEC	9.000	5.000	.	.	.	12.000
FLD TURBIDITY (FTU)			DET'N LIMIT = N/A		GUIDELINE = 1.0 (A1)	
JAN	3.600	.260	1.200	.500	1.000	.600
FEB	14.000	.040	5.200	.280	.300	.260
MAR	1.560	.040	.	.	.480	.500
APR	9.400	.380	1.000	.600	.800	.310
MAY	2.600	.360	3.500	.260	.560	.340
JUN	5.900	.130	4.150	.140	.260	.220
JUL	2.500	.170	.	.	.930	.300
AUG	1.510	.070	3.200	.250	.500	.200
SEP	10.200	.160	2.400	.130	.560	.250
OCT	2.180	.050	.	.160	.450	.220
NOV	34.500	.060	.	.240	.340	.220
DEC	28.460	.040	.	.	.	.180

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHEMISTRY (LAB)						
ALKALINITY (MG/L)			DET'N LIMIT = .200		GUIDELINE = 30-500 (A4)	
JAN	100.300	87.000	93.200	86.900	89.000	89.800
FEB	98.900	90.100	89.100	89.300	90.500	90.600
MAR	101.300	91.400	.	.	90.700	90.900
APR	IIS	91.400	91.800	92.000	92.400	92.200
MAY	101.000	94.000	94.500	94.400	95.600	IIS
JUN	96.400	89.700	89.800	91.300	90.400	90.500
JUL	98.700	86.700	.	.	89.900	89.100
AUG	110.700	94.500	92.500	93.400	92.400	93.100
SEP	94.700	88.100	89.800	88.900	89.700	89.500
OCT	93.000	86.600	.	87.100	88.100	87.700
NOV	98.500	89.900	.	90.400	91.200	90.900
DEC	90.300	83.300	.	.	.	84.000
CALCIUM (MG/L)			DET'N LIMIT = .100		GUIDELINE = 100 (F2)	
JAN	34.600	33.000	33.600	33.200	33.400	33.200
FEB	35.200	35.000	34.800	34.400	35.400	34.400
MAR	37.600	36.400	.	.	35.400	35.600
APR	35.600	37.600	36.600	37.000	37.000	36.600
MAY	39.200	39.200	40.200	39.600	40.400	39.400
JUN	35.400	35.800	35.400	35.400	35.600	35.200
JUL	37.400	36.600	.	.	36.800	37.000
AUG	39.000	35.800	34.600	35.600	34.800	34.400
SEP	33.800	34.800	34.400	34.800	33.000	36.000
OCT	34.400	33.800	.	34.400	35.000	34.400
NOV	35.000	33.200	.	33.000	34.200	33.800
DEC	36.000	36.200	.	.	.	36.400
CHLORIDE (MG/L)			DET'N LIMIT = .200		GUIDELINE = 250 (A3)	
JAN	13.500	14.800	15.800	14.600	15.000	14.600
FEB	14.200	15.700	16.400	15.400	15.400	15.300
MAR	14.800	15.400	.	.	15.200	15.100
APR	14.500	16.400	16.600	16.300	16.500	16.600
MAY	15.200	16.800	17.200	16.800	17.100	1.400
JUN	14.600	15.700	16.400	15.800	15.600	15.600
JUL	14.800	17.100	.	.	17.100	17.000
AUG	14.400	16.200	16.800	16.500	16.300	16.300
SEP	14.300	16.200	17.100	16.400	16.400	16.300
OCT	14.500	16.900	.	16.800	16.800	16.700
NOV	14.600	16.400	.	16.400	16.500	16.500
DEC	11.900	14.300	.	.	.	14.400
COLOUR (HZU)			DET'N LIMIT = .5		GUIDELINE = 5.0 (A3)	
JAN	.500 <T	1.000 <T	3.000	1.000 <T	2.000 <T	1.500 <T
FEB	1.500 <T	1.500 <T	6.000	1.500 <T	2.500	1.500 <T
MAR	1.000 <T	.500 <T	.	.	2.000 <T	2.000 <T

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
APR	IIS	.500 <T	6.000	1.500 <T	2.000 <T	2.000 <T
MAY	14.500	1.000 <T	4.500	1.500 <T	1.500 <T	BDL
JUN	1.500 <T	1.000 <T	5.000	1.500 <T	1.500 <T	2.000 <T
JUL	1.500 <T	2.500	.	.	2.500	2.500
AUG	2.000 <T	1.500 <T	11.000	1.500 <T	2.500	2.500
SEP	1.000 <T	.500 <T	4.500	1.500 <T	2.000 <T	2.000 <T
OCT	1.000 <T	.500 <T	.	.500 <T	2.000 <T	1.500 <T
NOV	BDL	BDL	.	1.000 <T	1.000 <T	1.500 <T
DEC	.500 <T	BDL	.	.	.	1.000 <T
CONDUCTIVITY (UMHO/CM)			DET'N LIMIT = 1		GUIDELINE = 400 (F2)	
JAN	270	273	279	273	275	274
FEB	277	283	283	279	282	282
MAR	290	284	.	.	282	281
APR	IIS	296	299	295	296	295
MAY	296	301	302	300	302	IIS
JUN	281	284	285	284	282	283
JUL	279	282	.	.	284	283
AUG	300	285	283	282	280	281
SEP	271	274	279	276	276	275
OCT	272	276	.	278	278	277
NOV	282	287	.	286	287	286
DEC	253	266	.	.	.	266
FLUORIDE (MG/L)			DET'N LIMIT = .01		GUIDELINE = 2.400 (A1)	
JAN	.100	.100	.080	.080	.080	.100
FEB	.120	.100	.100	.100	.100	.100
MAR	.120	.100	.	.	.100	.120
APR	.120	.120	.120	.120	.100	.100
MAY	.120	.120	.100	.120	.120	.020 <T
JUN	.100	.100	.080	.080	.080	.080
JUL	.120	.100	.	.	.100	.100
AUG	.100	.080	.080	.080	.100	.080
SEP	.120	.120	.100	.100	.100	.100
OCT	.100	.100	.	.100	.100	.100
NOV	.120	.100	.	.100	.100	.100
DEC	.100	.100	.	.	.	.080
HARDNESS (MG/L)			DET'N LIMIT = .500		GUIDELINE = 80-100 (A4)	
JAN	121.000	117.000	117.000	117.000	117.000	117.000
FEB	123.000	122.000	121.000	120.000	123.000	121.000
MAR	130.000	127.000	.	.	125.000	122.000
APR	124.000	129.000	126.000	127.000	127.000	126.000
MAY	135.000	135.000	137.000	135.000	138.000	135.000
JUN	124.000	124.000	125.000	124.000	125.000	124.000
JUL	127.000	126.000	.	.	126.000	126.000
AUG	132.000	124.000	120.000	123.000	120.000	120.000

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
SEP	118.000	121.000	120.000	122.000	116.000	123.000
OCT	120.000	119.000	.	120.000	122.000	119.000
NOV	123.000	119.000	.	117.000	120.000	119.000
DEC	125.000	125.000	.	.	.	125.000
IONCAL (DMNSLESS)			DET'N LIMIT = N/A		GUIDELINE = N/A	
JAN	3.969	2.439	6.670	2.097	3.806	5.947
FEB	.258	1.576	.873	3.117	1.795	.171
MAR	.875	.715	.	.	.034	1.018
APR	.000 NAF	3.619	1.743	2.572	1.800	1.197
MAY	5.148	5.628	6.956	5.379	6.431	.000 NAF
JUN	.122	1.241	.187	.113	1.126	.412
JUL	2.726	4.502	.	.	2.170	3.348
AUG	2.433	2.108	3.581	2.526	3.525	3.959
SEP	2.734	1.240	3.434	1.375	5.537	.150
OCT	.946	1.378	.	.444	.797	1.285
NOV	3.250	6.077	.	7.175	5.177	5.425
DEC	7.275	4.893	.	.	.	5.080
LANGELIERS INDEX (DMNSLESS)			DET'N LIMIT = N/A		GUIDELINE = N/A	
JAN	-.497	-.590	-.535	.072	.134	-.054
FEB	.352	.226	.179	.157	.194	.162
MAR	.396	.299	.	.	.285	.258
APR	.	.389	.298	.375	.356	.381
MAY	.560	.407	.370	.454	.507	.
JUN	.231	.224	.189	.267	.306	.281
JUL	.216	.000	.	.	.047	.066
AUG	.576	.316	.233	.340	.326	.264
SEP	.338	.298	.209	.201	.232	.279
OCT	.277	.267	.	.356	.309	.309
NOV	.305	.211	.	.191	.350	.374
DEC	.421	.394	.	.	.	.310
MAGNESIUM (MG/L)			DET'N LIMIT = .050		GUIDELINE = 30 (F2)	
JAN	8.300	8.400	8.100	8.300	8.100	8.100
FEB	8.500	8.500	8.400	8.400	8.500	8.600
MAR	8.800	8.700	.	.	8.800	8.100
APR	8.500	8.500	8.500	8.500	8.500	8.400
MAY	8.900	9.000	9.000	8.800	9.000	8.900
JUN	8.600	8.600	8.800	8.700	8.700	8.700
JUL	8.300	8.400	.	.	8.200	8.200
AUG	8.500	8.400	8.300	8.200	7.900	8.200
SEP	8.200	8.300	8.200	8.400	8.200	8.100
OCT	8.200	8.300	.	8.300	8.200	8.000
NOV	8.700	8.700	.	8.500	8.500	8.400
DEC	8.400	8.300	.	.	.	8.300

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
SODIUM (MG/L)			DET'N LIMIT = .200		GUIDELINE = 200 (C3)	
JAN	7.200	7.000	7.600	7.000	7.200	6.800
FEB	7.400	7.200	7.600	6.800	7.000	7.400
MAR	7.600	7.000	.	.	6.800	7.200
APR	7.800	7.800	8.000	7.800	7.600	7.800
MAY	8.000	8.200	8.200	7.800	8.000	7.800
JUN	7.800	7.800	7.600	7.600	7.600	7.600
JUL	8.600	8.400	.	.	8.400	8.400
AUG	8.000	7.800	8.000	7.800	8.000	7.800
SEP	7.600	7.400	7.600	7.400	7.600	7.400
OCT	7.400	7.400	.	7.400	7.000	7.400
NOV	8.000	8.000	.	8.000	8.200	8.200
DEC	6.200	6.400	.	.	.	6.400
AMMONIUM TOTAL (MG/L)			DET'N LIMIT = 0.002		GUIDELINE = .05 (F2)	
JAN	.006 <T	.004 <T	.014	.008 <T	.008 <T	.006 <T
FEB	.006 <T	.008 <T	.008 <T	.004 <T	.006 <T	.004 <T
MAR	BDL	BDL	.	.	BDL	BDL
APR	BDL	BDL	BDL	.002 <T	.006 <T	.002 <T
MAY	.008	.008	.026	.002	.018	IIS
JUN	BDL	.002 <T	BDL	.002 <T	.002 <T	BDL
JUL	.022	.002 <T	.	.	.002 <T	.004 <T
AUG	.036	BDL	BDL	BDL	BDL	BDL
SEP	.022	.004 <T	.036	.002 <T	.002 <T	.002 <T
OCT	BDL	BDL	.	BDL	BDL	BDL
NOV	.020	BDL	.	BDL	BDL	BDL
DEC	BDL	BDL	.	.	.	BDL
NITRITE (MG/L)			DET'N LIMIT = 0.001		GUIDELINE = 1.000 (A1)	
JAN	.004 <T	.003 <T	.004 <T	.003 <T	.003 <T	.003 <T
FEB	.006	.004 <T	.006	.003 <T	.004 <T	.003 <T
MAR	.004 <T	BDL	.	.	.001 <T	BDL
APR	BDL	BDL	.004 <T	BDL	.001 <T	BDL
MAY	.001 <T	BDL	.004 <T	.001 <T	.002 <T	IIS
JUN	.006	.004 <T	.006	.004 <T	.004 <T	.004 <T
JUL	.001 <T	.001 <T	.	.	.004 <T	BDL
AUG	.002 <T	BDL	.001 <T	BDL	BDL	BDL
SEP	.004 <T	.003 <T	.006	.003 <T	.005	.003 <T
OCT	.002 <T	BDL	.	.001 <T	.001 <T	.001 <T
NOV	.013	.002 <T	.	.002 <T	.007	.002 <T
DEC	.005	BDL	.	.	.	BDL
TOTAL NITRATES (MG/L)			DET'N LIMIT = .020		GUIDELINE = 10.000 (A1)	
JAN	.365	.410	.415	.410	.415	.420
FEB	.170	.185	.225	.255	.250	.220
MAR	.150	.335	.	.	.395	.395
APR	BDL	.170	.175	.160	.165	.165

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
MAY	.110	.145	.125	.125	.140	IIS
JUN	.385	.370	.365	.350	.360	.360
JUL	.210	.225	.	.	.215	.215
AUG	.200	.200	.210	.205	.205	.205
SEP	.195	.225	.210	.225	.235	.235
OCT	.180	.170	.	.160	.155	.145
NOV	.175	.125	.	.130	.130	.125
DEC	.170	.160	.	.	.	.155
NITROGEN TOT KJELD (MG/L)			DET'N LIMIT = .020		GUIDELINE = N/A	
JAN	.210	.130	.300	.130	.130	.130
FEB	.260	.140	.225	.130	.130	.140
MAR	.525	.150	.	.	.180	.180
APR	IIS	.130	.250	.130	.190	.120
MAY	.190	.140	.240	.130	.240	IIS
JUN	.240	.160	.260	.150	.150	.140
JUL	.240	.160	.	.	.220	.150
AUG	.320	.170	.200	.150	.220	.160
SEP	.300	.170	.370	.170	.170	.150
OCT	.220	.170	.	.160	.170	.150
NOV	.325	.130	.	.120	.150	.130
DEC	.260	.140	.	.	.	.160
PH (DIMNSLESS)			DET'N LIMIT = N/A		GUIDELINE = 6.5-8.5(A4)	
JAN	7.390	7.380	7.400	8.040	8.090	7.900
FEB	8.240	8.160	8.120	8.100	8.120	8.100
MAR	8.250	8.210	.	.	8.210	8.180
APR	IIS	8.290	8.210	8.280	8.260	8.290
MAY	8.400	8.280	8.230	8.320	8.360	IIS
JUN	8.130	8.150	8.120	8.190	8.230	8.210
JUL	8.080	7.930	.	.	7.960	7.980
AUG	8.380	8.220	8.160	8.250	8.250	8.190
SEP	8.260	8.240	8.150	8.140	8.190	8.200
OCT	8.200	8.230	.	8.310	8.250	8.260
NOV	8.200	8.170	.	8.150	8.290	8.320
DEC	8.330	8.340	.	.	.	8.250
PHOSPHORUS FIL REACT (MG/L)			DET'N LIMIT = .0005		GUIDELINE = N/A	
JAN	.007	.000 <T	.	.	.	.
FEB	.004	.000	.	.	.	.
MAR	.008	BDL	.	.	.	.
APR	BDL	BDL	.	.	.	.
MAY	.003	BDL	.	.	.	.
JUN	.002 <T	BDL	.	.	.	.
JUL	.000 <T	.000 <T	.	.	.	.
AUG	BDL	BDL	.	.	.	.
SEP	.002	BDL	.	.	.	.

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
OCT	.002	.001 <T	.	.	.	.
NOV	.018	.002 <T	.	.	.	.
DEC	.008	BDL	.	.	.	.
PHOSPHORUS TOTAL (MG/L)			DET'N LIMIT = .002		GUIDELINE = .40 (F2)	
JAN	.018	.002 <T	.	.	.	.
FEB	.044	.003 <T	.	.	.	.
MAR	.080	BDL	.	.	.	.
APR	IIS	BDL	.	.	.	.
MAY	.009 <T	.002 <T	.	.	.	.
JUN	.020	BDL	.	.	.	.
JUL	.011	.002 <T	.	.	.	.
AUG	.021	.002 <T	.	.	.	.
SEP	.037	.003 <T	.	.	.	.
OCT	.010	BDL	.	.	.	.
NOV	.043	BDL	.	.	.	.
DEC	.330	.002 <T	.	.	.	.
SULPHATE (MG/L)			DET'N LIMIT = .200		GUIDELINE = 500. (A3)	
JAN	20.170	25.060	24.750	25.050	24.750	25.850
FEB	18.960	26.190	25.100	26.410	26.830	23.640
MAR	21.680	25.470	.	.	24.710	24.600
APR	IIS	24.500	24.390	24.080	24.040	23.960
MAY	20.700	25.300	24.930	24.650	24.650	.
JUN	21.280	25.730	25.530	24.960	24.870	24.770
JUL	21.200	25.320	.	.	25.000	24.830
AUG	20.850	24.740	24.860	24.630	24.420	24.130
SEP	21.890	25.960	25.210	25.510	25.250	25.100
OCT	19.500	24.380	.	24.290	24.030	23.810
NOV	24.450	29.610	.	29.190	29.140	28.340
DEC	19.980	26.760	.	.	.	26.220
TURBIDITY (FTU)			DET'N LIMIT = .02		GUIDELINE = 1.00 (A1)	
JAN	4.300	.600	.820	.840	.870	1.010
FEB	29.000	.900	6.100 RRV	.540	.710	.510
MAR	68.000	.430	.	.	.830	.660
APR	IIS	.310	8.500 RRV	.400	.660	.910
MAY	4.500	.500	3.000 RRV	.540	1.410 RRV	IIS
JUN	7.300	.700	1.940 RRV	.630	.610	.810
JUL	2.200 USD	2.500	.	.	.710	.350
AUG	7.000	.920	.960	.820	.980	.950
SEP	14.500	.370	.560	.220 <T	.330	.400
OCT	3.200	.600	.	.450	.600	.500
NOV	39.000	.670	.	.490	.840	.460
DEC	26.000	.480	.	.	.	.640

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
METALS						
SILVER (UG/L)				DET'N LIMIT = .020 GUIDELINE = 50. (A1)		
JAN	BDL	BDL	BDL	BDL	BDL	BDL
FEB	BDL	BDL	BDL	BDL	BDL	BDL
MAR	BDL	BDL	.	.	.040 <T	BDL
APR	.060 <T	.030 <T	.070 <T	.050 <T	.050 <T	.120 <T
MAY	BDL	BDL	BDL	BDL	BDL	.040 <T
JUN	.100 <T	BDL	.030 <T	.030 <T	.030 <T	BDL
JUL	BDL	.030 <T	.	.	.070 <T	.030 <T
AUG	BDL	BDL	BDL	BDL	BDL	.040 <T
SEP	BDL	.030 <T	.040 <T	BDL	.040 <T	BDL
OCT	BDL	BDL	.	BDL	BDL	BDL
NOV	BDL	BDL	.	BDL	BDL	BDL
DEC	BDL	BDL	.	.	.	BDL
ALUMINUM (UG/L)				DET'N LIMIT = .050 GUIDELINE = 100.(A4)		
JAN	77.720	25.520	26.680	20.880	30.160	20.880
FEB	162.400	29.000	29.000	26.680	31.320	29.000
MAR	139.200	38.280	.	.	35.960	31.320
APR	162.400	49.880	49.880	39.440	41.760	48.720
MAY	52.200	70.760	66.120	54.520	58.000	60.320
JUN	54.000	43.000	53.000	48.000	47.000	53.000
JUL	45.000	130.000	.	.	90.000	94.000
AUG	30.000	170.000	150.000	150.000	180.000	200.000
SEP	64.000	240.000	170.000	170.000	160.000	180.000
OCT	69.000	200.000	.	150.000	170.000	170.000
NOV	160.000	96.000	.	85.000	93.000	88.000
DEC	160.000	48.000	.	.	.	44.000
ARSENIC (UG/L)				DET'N LIMIT = 0.050 GUIDELINE = 50.0 (A1)		
JAN	.840 <T	.230 <T	.320 <T	.290 <T	.430 <T	.290 <T
FEB	.860 <T	.280 <T	.570 <T	.320 <T	.100 <T	.240 <T
MAR	1.500	.810 <T	.	.	.610 <T	.710 <T
APR	1.000 <T	.800 <T	1.500	.840 <T	.830 <T	.830 <T
MAY	.940 <T	.810 <T	1.100	.690 <T	.790 <T	.880 <T
JUN	.940 <T	.750 <T	1.100	.740 <T	.560 <T	.660 <T
JUL	.770 <T	.660 <T	.	.	.660 <T	.620 <T
AUG	.940 <T	.700 <T	.710 <T	.780 <T	.790 <T	.670 <T
SEP	1.600	.990 <T	1.100	1.200	1.000 <T	1.000 <T
OCT	.920 <T	.520 <T	.	.440 <T	.370 <T	.410 <T
NOV	.770 <T	.240 <T	.	.230 <T	.370 <T	.410 <T
DEC	.710 <T	.110 <T	.	.	.	.370 <T
BARIUM (UG/L)				DET'N LIMIT = 0.020 GUIDELINE = 1000. (A1)		
JAN	19.000	17.000	19.000	17.000	18.000	17.000
FEB	22.000	19.000	18.000	18.000	19.000	18.000
MAR	24.000	18.000	.	.	17.000	18.000

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DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
APR	23.000	21.000	19.000	20.000	19.000	20.000
MAY	21.000	21.000	22.000	21.000	23.000	21.000
JUN	21.000	19.000	20.000	20.000	20.000	20.000
JUL	19.000	19.000	.	.	20.000	22.000
AUG	24.000	22.000	21.000	21.000	21.000	22.000
SEP	23.000	23.000	22.000	22.000	23.000	23.000
OCT	19.000	18.000	.	18.000	18.000	18.000
NOV	23.000	20.000	.	21.000	20.000	20.000
DEC	18.000	18.000	.	.	.	18.000
BORON (UG/L)			DET'N LIMIT = 0.200 GUIDELINE = 5000. (A1)			
JAN	46.000	24.000	45.000	48.000	31.000	37.000
FEB	23.000	21.000	22.000	18.000 <T	21.000	22.000
MAR	86.000	28.000	.	.	82.000	33.000
APR	57.000	46.000	37.000	28.000	27.000	59.000
MAY	27.000	150.000	210.000	99.000	100.000	210.000
JUN	23.000	27.000	30.000	33.000	21.000	20.000 <T
JUL	22.000	33.000	.	.	21.000	21.000
AUG	21.000	21.000	21.000	21.000	21.000	22.000
SEP	44.000	31.000	49.000	48.000	37.000	32.000
OCT	21.000	21.000	.	22.000	22.000	21.000
NOV	20.000 <T	20.000 <T	.	22.000	22.000	22.000
DEC	18.000 <T	17.000 <T	.	.	.	18.000 <T
BERYLLIUM (UG/L)			DET'N LIMIT = 0.010 GUIDELINE = N/A			
JAN	.110 <T	.040 <T	.050 <T	BDL	.020 <T	.080 <T
FEB	BDL	BDL	BDL	BDL	BDL	BDL
MAR	.250 <T	.020 <T	.	.	.220 <T	.130 <T
APR	.040 <T	.040 <T	.070 <T	.050 <T	.090 <T	BDL
MAY	.040 <T	.080 <T	.410 <T	.120 <T	.110 <T	.200 <T
JUN	.070 <T	.040 <T	BDL	.120 <T	BDL	BDL
JUL	BDL	.100 <T	.	.	BDL	BDL
AUG	.060 <T	BDL	BDL	BDL	.040 <T	.030 <T
SEP	BDL	BDL	.030 <T	.050 <T	BDL	BDL
OCT	BDL	BDL	.	BDL	BDL	BDL
NOV	.030 <T	BDL	.	BDL	.030 <T	.020 <T
DEC	BDL	BDL	.	.	.	BDL
CADMIUM (UG/L)			DET'N LIMIT = 0.050 GUIDELINE = 5.000 (A1)			
JAN	BDL	BDL	.510	BDL	BDL	BDL
FEB	BDL	BDL	.070 <T	BDL	BDL	BDL
MAR	.110 <T	BDL	.	.	.090 <T	BDL
APR	.090 <T	.100 <T	.260 <T	BDL	.100 <T	.270 <T
MAY	.070 <T	BDL	.280 <T	.120 <T	.610	BDL
JUN	BDL	BDL	.410 <T	BDL	BDL	BDL
JUL	BDL	BDL	.	.	.150 <T	BDL
AUG	BDL	.060 <T	BDL	BDL	.230 <T	BDL

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DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
SEP	BDL	BDL	.500 <T	BDL	.210 <T	BDL
OCT	BDL	BDL	.	BDL	BDL	BDL
NOV	.090 <T	BDL	.	BDL	.140 <T	BDL
DEC	BDL	BDL	.	.	.	BDL
COBALT (UG/L)			DET'N LIMIT = 0.020 GUIDELINE = N/A			
JAN	.160 <T	.110 <T	.260 <T	.080 <T	.150 <T	.120 <T
FEB	.280 <T	.080 <T	.180 <T	.080 <T	.090 <T	BDL
MAR	.490 <T	.140 <T	.	.	.180 <T	.190 <T
APR	.170 <T	.080 <T	.310 <T	.090 <T	.130 <T	.160 <T
MAY	.180 <T	.090 <T	.230 <T	.160 <T	.280 <T	.130 <T
JUN	.050 <T	BDL	.220 <T	BDL	.140 <T	BDL
JUL	BDL	BDL	.	.	BDL	BDL
AUG	.120 <T	.100 <T	.140 <T	.070 <T	.140 <T	.140 <T
SEP	.160 <T	.100 <T	.290 <T	.080 <T	.150 <T	.070 <T
OCT	.080 <T	.060 <T	.	.030 <T	.090 <T	.030 <T
NOV	.340 <T	.030 <T	.	.050 <T	.070 <T	BDL
DEC	.410 <T	.120 <T	.	.	.	.110 <T
CHROMIUM (UG/L)			DET'N LIMIT = 0.100 GUIDELINE = 50. (A1)			
JAN	4.300	1.200	3.900	4.500	2.000	2.700
FEB	.910 <T	.370 <T	1.200	.140 <T	.300 <T	.310 <T
MAR	7.600	1.100	.	.	7.000	1.700
APR	1.600	1.300	3.500	.460 <T	.360 <T	2.000
MAY	.560 <T	5.200	8.200	3.200	3.500	7.400
JUN	.460 <T	2.300	1.500	4.300	.400 <T	.150 <T
JUL	.670 <T	4.200	.	.	.700 <T	.190 <T
AUG	.380 <T	.390 <T	.410 <T	.240 <T	.350 <T	.220 <T
SEP	4.300	2.000	4.700	4.900	2.800	1.900
OCT	BDL	.150 <T	.	.160 <T	.160 <T	.160 <T
NOV	.400 <T	.300 <T	.	.230 <T	.270 <T	.290 <T
DEC	.260 <T	BDL	.	.	.	BDL
COPPER (UG/L)			DET'N LIMIT = .100 GUIDELINE = 1000 (A3)			
JAN	1.700	1.500	38.000	4.800	74.000	6.000
FEB	2.400	1.700	74.000	4.800	72.000	6.700
MAR	3.200	1.300	.	.	30.000	7.000
APR	2.200	1.400	100.000	5.300	4.700	56.000
MAY	2.200	1.500	36.000	9.200	98.000	8.200
JUN	2.300	1.300	74.000	6.400	57.000	9.100
JUL	2.000	1.600	.	.	30.000	8.100
AUG	2.200	1.600	52.000	6.700	24.000	5.700
SEP	1.800	1.600	76.000	6.700	42.000	7.500
OCT	1.600	1.400	.	5.100	39.000	5.500
NOV	2.200	1.200	.	5.200	27.000	8.800
DEC	2.000	1.300 <T	.	.	.	7.100

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DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1	SITE 2		
			STANDING	FREE FLOW	STANDING	FREE FLOW
IRON (UG/L)				DET'N LIMIT = 4.000 GUIDELINE = 300. (A3)		
JAN	78.000	23.000 <T	230.000	51.000	110.000	86.000
FEB	380.000	44.000 <T	1000.000	67.000	62.000	84.000
MAR	660.000	44.000 <T	.	.	110.000	81.000
APR	140.000	26.000 <T	1100.000	57.000	79.000	140.000
MAY	71.000	16.000 <T	320.000	62.000	67.000	75.000
JUN	48.000 <T	6.000 <T	600.000	58.000	67.000	84.000
JUL	50.000 <T	37.000 <T	.	.	130.000	81.000
AUG	59.000	28.000 <T	510.000	56.000	88.000	110.000
SEP	74.000	13.000 <T	350.000	70.000	96.000	78.000
OCT	69.000	15.000 <T	.	39.000 <T	96.000	68.000
NOV	360.000	12.000 <T	.	48.000 <T	80.000	66.000
DEC	310.000	14.000 <T	.	.	.	59.000 <T
MERCURY (UG/L)				DET'N LIMIT = 0.010 GUIDELINE = 1.000 (A1)		
JAN	BDL	BDL	.	BDL	.	BDL
FEB	BDL	BDL	.	BDL	.	BDL
MAR	BDL	.040 <T	.	.	.	BDL
APR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	BDL	.	BDL	.	BDL
JUN	BDL	.020 <T	.	BDL	.	BDL
JUL	BDL	.020 <T	.	.	.	BDL
AUG	.100	BDL	.	BDL	.	BDL
SEP	.230	BDL	.	BDL	.	BDL
OCT	.080	BDL	.	BDL	.	BDL
NOV	BDL	BDL	.	BDL	.	BDL
DEC	.070	BDL	.	.	.	BDL
MANGANESE (UG/L)				DET'N LIMIT = .050 GUIDELINE = 50.0 (A3)		
JAN	4.900	.620	15.000	7.900	5.200	6.400
FEB	43.000	1.100	16.000	11.000	4.100	6.900
MAR	66.000	.740	.	.	7.400	6.400
APR	6.200	.840	21.000	8.300	7.000	7.400
MAY	5.700	.920	16.000	11.000	6.800	8.700
JUN	4.600	.130 <T	18.000	14.000	5.300	9.200
JUL	6.900	.830	.	.	11.000	8.900
AUG	10.000	.570	20.000	14.000	9.400	10.000
SEP	14.000	.500 <T	23.000	18.000	9.600	10.000
OCT	6.300	.480 <T	.	11.000	7.000	8.100
NOV	25.000	.360 <T	.	13.000	7.200	6.700
DEC	18.000	.490 <T	.	.	.	5.200
MOLYBDENUM (UG/L)				DET'N LIMIT = 0.020 GUIDELINE = N/A		
JAN	.790	.930	.920	.840	.950	.920
FEB	.770	1.200	1.100	1.200	1.100	1.000
MAR	1.000	1.200	.	.	1.200	1.300
APR	1.400	1.400	.830	1.300	1.300	1.300

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DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
MAY	1.400	1.500	1.300	1.400	1.500	1.400
JUN	1.400	1.700	1.300	1.300	1.400	1.400
JUL	1.500	1.400	.	.	1.400	1.200
AUG	1.200	1.300	1.100	1.200	1.300	1.100
SEP	1.500	1.500	1.400	1.400	1.400	1.500
OCT	1.100	1.200	.	1.100	1.100	1.200
NOV	.960	1.300	.	1.200	1.200	1.300
DEC	.800	1.100	.	.	.	1.200
NICKEL (UG/L)				DET'N LIMIT = 0.100 GUIDELINE = 50. (F3)		
JAN	1.300 <T	.900 <T	4.900	.840 <T	4.400	.710 <T
FEB	1.200 <T	.760 <T	2.400	.820 <T	3.500	BDL
MAR	1.500 <T	.310 <T	.	.	2.300	.960 <T
APR	.920 <T	.840 <T	5.100	.520 <T	.480 <T	4.700
MAY	1.400 <T	1.300 <T	14.000	1.700 <T	13.000	1.400 <T
JUN	.340 <T	.160 <T	5.600	BDL	.150 <T	BDL
JUL	BDL	BDL	.	.	2.700	BDL
AUG	1.500 <T	1.100 <T	6.200	.820 <T	2.700	.870 <T
SEP	1.200 <T	1.100 <T	19.000	1.100 <T	3.100	.780 <T
OCT	.770 <T	.780 <T	.	.360 <T	3.200	.510 <T
NOV	2.500	2.900	.	1.600 <T	4.300	1.600 <T
DEC	1.700 <T	1.100 <T	.	.	.	.900 <T
LEAD (UG/L)				DET'N LIMIT = 0.050 GUIDELINE = 50. (A1)		
JAN	.180 <T	.130 <T	3.700	.240	13.000	.630
FEB	.850	.240	7.400	.340	7.300	.470
MAR	1.800	.830	.	.	4.500	.710
APR	.350	.210	11.000	.740	.480	8.700
MAY	.360	.220	3.200	.670	8.800	.670
JUN	.730	.240	6.900	.480	2.500	1.000
JUL	.330	.970	.	.	4.700	.950
AUG	.870	1.300	6.400	.740	2.800	.810
SEP	.470	.520	10.000	1.000	5.700	1.100
OCT	.070 <T	.150 <T	.	.260	5.700	.370
NOV	.530	.090 <T	.	.390	3.300	.650
DEC	.620	.180 <T	.	.	.	.360 <T
ANTIMONY (UG/L)				DET'N LIMIT = .050 GUIDELINE = 146. (D4)		
JAN	.410	.420	.370	.390	.370	.430
FEB	.380	.420	.510	.370	.520	.490
MAR	.600	.630	.	.	.530	.680
APR	.610	.650	.800	.680	.760	.680
MAY	1.000	.940	.940	.980	1.100	.900
JUN	1.000	.900	.910	.950	1.100	1.100
JUL	.780	.680	.	.	.830	.810
AUG	.670	.660	.680	.690	.640	.760
SEP	.580	.560	.690	.630	.670	.630

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DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
OCT	.540	.520	.	.500	.580	.500
NOV	.320	.360	.	.430	.430	.420
DEC	.510	.510	.	.	.	.510
SELENIUM (UG/L)			DET'N LIMIT = 0.200 GUIDELINE = 10. (A1)			
JAN	1.600 <T	2.500 <T	1.900 <T	2.000 <T	1.900 <T	1.400 <T
FEB	.280 <T	1.500 <T	1.300 <T	1.100 <T	.460 <T	1.000 <T
MAR	6.300 <T	5.900 <T	.	.	5.600 <T	7.900 <T
APR	3.600 <T	3.600 <T	2.900 <T	1.700 <T	3.400 <T	1.300 <T
MAY	4.500 <T	5.400 <T	6.900 <T	7.500 <T	5.300 <T	5.400 <T
JUN	3.600 <T	4.400 <T	6.400 <T	5.400 <T	3.800 <T	3.500 <T
JUL	4.100 <T	6.500	.	.	4.600 <T	3.900 <T
AUG	BDL	1.600 <T	1.300 <T	2.500 <T	2.300 <T	2.100 <T
SEP	BDL	BDL	1.500 <T	2.100 <T	3.300 <T	1.300 <T
OCT	BDL	BDL	.	BDL	BDL	1.100 <T
NOV	BDL	BDL	.	BDL	BDL	BDL
DEC	BDL	BDL	.	.	.	BDL
STRONTIUM (UG/L)			DET'N LIMIT = .050 GUIDELINE = N/A			
JAN	130.000	130.000	130.000	130.000	130.000	130.000
FEB	140.000	140.000	130.000	140.000	140.000	140.000
MAR	160.000	150.000	.	.	140.000	150.000
APR	160.000	150.000	160.000	160.000	160.000	160.000
MAY	160.000	160.000	160.000	170.000	170.000	170.000
JUN	160.000	160.000	160.000	160.000	160.000	160.000
JUL	140.000	150.000	.	.	150.000	160.000
AUG	150.000	140.000	150.000	150.000	150.000	160.000
SEP	150.000	150.000	150.000	150.000	160.000	160.000
OCT	130.000	140.000	.	140.000	140.000	140.000
NOV	150.000	150.000	.	150.000	150.000	150.000
DEC	130.000	130.000	.	.	.	140.000
TITANIUM (UG/L)			DET'N LIMIT = .050 GUIDELINE = N/A			
JAN	6.200	3.700	4.300	4.500	4.100	4.400
FEB	7.200	3.200	6.800	3.900	3.600	3.800
MAR	8.600	4.500	.	.	4.100	4.000
APR	18.000	7.300	5.600	4.700	5.500	5.700
MAY	6.500	5.600	5.800	5.100	5.400	6.000
JUN	8.000	4.900	7.000	6.800	6.700	6.900
JUL	6.200	5.700	.	.	5.600	5.800
AUG	5.700	4.700	4.800	4.700	4.800	4.500
SEP	7.500	5.200	6.400	5.600	6.200	6.100
OCT	4.800	3.000	.	3.000	3.400	3.200
NOV	6.000	2.400	.	2.300	2.500	2.600
DEC	7.100	3.100 <T	.	.	.	3.100 <T
THALLIUM (UG/L)			DET'N LIMIT = .010 GUIDELINE = 13. (D4)			

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
JAN	BDL	BDL	BDL	BDL	BDL	BDL
FEB	BDL	BDL	.020 <T	.020 <T	BDL	BDL
MAR	.060 <T	.060 <T	.	.	.030 <T	BDL
APR	.020 <T	BDL	.020 <T	BDL	.020 <T	BDL
MAY	BDL	.040 <T	BDL	BDL	.030 <T	BDL
JUN	BDL	BDL	BDL	BDL	BDL	BDL
JUL	BDL	BDL	.	.	BDL	.070 <T
AUG	.020 <T	BDL	BDL	BDL	BDL	.050 <T
SEP	BDL	BDL	BDL	BDL	BDL	BDL
OCT	BDL	.030 <T	.	BDL	BDL	.020 <T
NOV	.040 <T	.030 <T	.	.050 <T	BDL	BDL
DEC	BDL	BDL	.	.	.	BDL
URANIUM (UG/L)				DET'N LIMIT = .020 GUIDELINE = 100.(B1)		
JAN	.320	.200 <T	.160 <T	.190 <T	.150 <T	.160 <T
FEB	.380	.280	.240	.210	.250	.180 <T
MAR	.510	.370	.	.	.370	.420
APR	.640	.470	.380	.370	.320	.340
MAY	.500	.400	.390	.390	.400	.400
JUN	.520	.420	.380	.380	.380	.480
JUL	.590	.540	.	.	.540	.450
AUG	.420	.300	.400	.320	.370	.490
SEP	.540	.530	.520	.440	.450	.400
OCT	.270	.250	.	.240	.220	.220
NOV	.400	.190 <T	.	.270	.250	.240
DEC	.360	.220 <T	.	.	.	.180 <T
VANADIUM (UG/L)				DET'N LIMIT = .050 GUIDELINE = N/A		
JAN	.340 <T	.640	.520	.410 <T	.590	.370 <T
FEB	.600	.550	.380 <T	.340 <T	.360 <T	.360 <T
MAR	.730	.480 <T	.	.	.480 <T	.360 <T
APR	.480 <T	.510	.480 <T	.350 <T	.440 <T	.660
MAY	.300 <T	.540	.490 <T	.510	.470 <T	.520
JUN	.330 <T	.600	.460 <T	.500 <T	.500 <T	.560
JUL	.300 <T	.640	.	.	.720	.530
AUG	.290 <T	.610	.550	.540	.670	.670
SEP	.490 <T	.660	.570	.580	.630	.590
OCT	.410 <T	.590	.	.450 <T	.580	.490 <T
NOV	.710	.630	.	.400 <T	.520	.450 <T
DEC	.690	.710	.	.	.	.490 <T
ZINC (UG/L)				DET'N LIMIT = .001 GUIDELINE = 5000. (A3)		
JAN	2.100	1.800	390.000	26.000	43.000	4.300
FEB	3.000	1.300	100.000	17.000	55.000	3.700
MAR	4.600	1.400	.	.	28.000	3.400
APR	3.000	3.300	170.000	14.000	2.800	50.000
MAY	2.100	1.800	150.000	27.000	110.000	5.700

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
JUN	2.800	2.300	100.000	24.000	16.000	6.000
JUL	2.500	2.300	.	.	28.000	5.100
AUG	4.700	1.500	130.000	24.000	24.000	2.700
SEP	2.200	1.500	170.000	28.000	42.000	4.400
OCT	1.300	.940 <T	.	13.000	32.000	3.200
NOV	4.900	1.600	.	19.000	51.000	7.800
DEC	3.000	.800 <T	.	.	.	4.800

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
PESTICIDES & PCB						
ALPHA BHC (NG/L)			DET'N LIMIT = 1.000		GUIDELINE = 700 (G)	
JAN	3.000 <T	3.000 <T	.	2.000 <T	.	2.000 <T
FEB	1.000 <T	BDL	.	1.000 <T	.	1.000 <T
MAR	1.000 <T	2.000 <T	.	.	.	1.000 <T
APR	BDL	1.000 <T	.	BDL	.	1.000 <T
MAY	1.000 <T	1.000 <T	.	1.000 <T	.	BDL
JUN	2.000 <T	BDL	.	2.000 <T	.	2.000 <T
JUL	3.000 <T	BDL	.	.	.	3.000 <T
AUG	BDL	2.000 <T	.	2.000 <T	.	2.000 <T
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	2.000 <T	.	BDL	.	!QU
NOV	1.000 <T	BDL	.	BDL	.	BDL
DEC	1.000 <T	1.000 <T	.	.	.	1.000 <T
LINDANE (NG/L)			DET'N LIMIT = 1.000		GUIDELINE = 4000 (A1)	
JAN	BDL	1.000 <T	.	BDL	.	BDL
FEB	BDL	BDL	.	BDL	.	BDL
MAR	BDL	BDL	.	.	.	BDL
APR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	BDL	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	.	.	BDL
AUG	BDL	BDL	.	BDL	.	BDL
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	!QU
NOV	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	.	.	BDL
ATRAZINE (NG/L)			DET'N LIMIT = 50.00		GUIDELINE = 60000 (B3)	
JAN	BDL	BDL	.	BDL	.	BDL
FEB	BDL	BDL	.	BDL	.	BDL
MAR	BDL	BDL	.	.	.	BDL
APR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	BDL	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	.	.	BDL
AUG	80.000 <T	60.000 <T	.	.	.	.
SEP	BDL	BDL	.	.	.	.
OCT	BDL	BDL	.	!AW	.	!AW
NOV	BDL	BDL	.	!NR	.	.
DEC	BDL	BDL	.	.	.	.

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
PHENOLICS (UG/L PHENOLICS)			DET'N LIMIT = 0.2		GUIDELINE = 2.00 (A3)	
JAN	1.600	1.200	.	.	.	.
FEB	2.000	1.600	.	.	.	.
MAR	1.200	1.400	.	.	.	.
APR	1.400	1.200	.	.	.	.
MAY	1.200	1.200	.	.	.	.
JUN	11.600	.800 <T	.	.	.	.
JUL	.800 <T	2.000	.	.	.	.
AUG	1.000 <T	1.000 <T	.	.	.	.
SEP	.600 <T	.400 <T	.	.	.	.
OCT	1.200	.600 <T	.	.	.	.
NOV	1.000	BDL	.	.	.	.
DEC	.400 <T	BDL	.	.	.	.

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
VOLATILES						
BENZENE (UG/L)				DET'N LIMIT = .050	GUIDELINE = 5.0 (81)	
JAN	BDL	BDL	.	BDL	.	BDL
FEB	BDL	BDL	.	BDL	.	BDL
MAR	BDL	BDL	.	.	.	.050 <T
APR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	BDL	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	.	.	BDL
AUG	BDL	.	.	BDL	.	BDL
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
NOV	BDL	BDL	.	BDL	.	IBT
DEC	BDL	.050 <T	.	.	.	.050 <T
TOLUENE (UG/L)				DET'N LIMIT = .050	GUIDELINE = 24.0 (84)	
JAN	BDL	BDL	.	.100 <T	.	BDL
FEB	.200 <T	BDL	.	BDL	.	BDL
MAR	.200 <T	.100 <T	.	.	.	.100 <T
APR	BDL	.100 <T	.	.050 <T	.	BDL
MAY	BDL	BDL	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
JUL	.100 <T	.050 <T	.	.	.	.050 <T
AUG	.150 <T	.	.	.200 <T	.	.200 <T
SEP	.100 <T	.100 <T	.	BDL	.	BDL
OCT	.100 <T	.050 <T	.	BDL	.	.050 <T
NOV	.100 <T	BDL	.	BDL	.	IBT
DEC	BDL	.100 <T	.	.	.	BDL
ETHYLBENZENE (UG/L)				DET'N LIMIT = .050	GUIDELINE = 2.4 (84)	
JAN	.150 <T	.050 <T	.	.100 <T	.	.050 <T
FEB	.050 <T	.100 <T	.	.100 <T	.	.050 <T
MAR	.100 <T	.050 <T	.	.	.	.050 <T
APR	.150 <T	.100 <T	.	.100 <T	.	.050 <T
MAY	.150 <T	.050 <T	.	.050 <T	.	.050 <T
JUN	.150 <T	.050 <T	.	.050 <T	.	.050 <T
JUL	BDL	BDL	.	.	.	BDL
AUG	BDL	.	.	BDL	.	BDL
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
NOV	BDL	BDL	.	BDL	.	IBT
DEC	BDL	.050 <T	.	.	.	BDL
M-XYLENE (UG/L)				DET'N LIMIT = .100	GUIDELINE = 300 (84)	
JAN	.200 <T	BDL	.	.100 <T	.	BDL
FEB	BDL	BDL	.	BDL	.	BDL
MAR	.200 <T	BDL	.	.	.	.100 <T

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
			SITE 1		SITE 2	
	RAW	TREATED	STANDING	FREE FLOW	STANDING	FREE FLOW
APR	.500 <T	BDL	.	BDL	.	BDL
MAY	.600 <T	BDL	.	.100 <T	.	.100 <T
JUN	.100 <T	.100 <T	.	BDL	.	BDL
JUL	BDL	BDL	.	.	.	BDL
AUG	BDL	.	.	BDL	.	BDL
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
NOV	BDL	BDL	.	BDL	.	IBT
DEC	BDL	BDL	.	.	.	BDL
O-XYLENE (UG/L)				DET'N LIMIT = .050 GUIDELINE = 300 (B4)		
JAN	.100 <T	.050 <T	.	.100 <T	.	.100 <T
FEB	BDL	BDL	.	BDL	.	BDL
MAR	.100 <T	BDL	.	.	.	BDL
APR	.200 <T	.050 <T	.	.100 <T	.	.050 <T
MAY	.400 <T	.050 <T	.	BDL	.	.100 <T
JUN	.150 <T	.050 <T	.	.050 <T	.	BDL
JUL	BDL	BDL	.	.	.	BDL
AUG	BDL	.	.	BDL	.	BDL
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
NOV	BDL	BDL	.	BDL	.	IBT
DEC	BDL	BDL	.	.	.	BDL
STYRENE (UG/L)				DET'N LIMIT = .050 GUIDELINE = 46.5 (D2)		
JAN	.300 <T	BDL	.	.100 <T	.	BDL
FEB	.250 <T	BDL	.	.100 <T	.	BDL
MAR	.450 <T	BDL	.	.	.	.050 <T
APR	.250 <T	BDL	.	.150 <T	.	.150 <T
MAY	BDL	BDL	.	BDL	.	.100 <T
JUN	.100 <T	BDL	.	.100 <T	.	.150 <T
JUL	.200 <T	BDL	.	.	.	.200 <T
AUG	BDL	.	.	.100 <T	.	.100 <T
SEP	BDL	BDL	.	.100 <T	.	BDL
OCT	.100 <T	BDL	.	.100 <T	.	.050 <T
NOV	BDL	.100 <T	.	BDL	.	IBT
DEC	.100 <T	BDL	.	.	.	.100 <T
CHLOROFORM (UG/L)				DET'N LIMIT = .100 GUIDELINE = 350 (A1+)		
JAN	14.700	28.700	.	31.000	.	26.700
FEB	10.000	27.700	.	25.100	.	22.500
MAR	9.600	26.300	.	.	.	30.300
APR	13.800	34.000	.	29.700	.	28.700
MAY	15.100	33.500	.	33.700	.	27.800
JUN	12.600	35.000	.	27.700	.	27.600
JUL	12.800 RRV	46.100	.	.	.	37.000
AUG	3.000	.	.	19.700	.	21.500

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
SEP	9.800	42.300	.	29.000	.	29.100
OCT	8.800	37.400	.	33.800	.	32.100
NOV	4.500	30.600	.	24.900	.	IBT
DEC	7.100	32.600	.	.	.	26.200
111, TRICHLOROETHANE (UG/L)				DET'N LIMIT = .020 GUIDELINE = 200 (D1)		
JAN	BDL	BDL	.	BDL	.	BDL
FEB	BDL	BDL	.	BDL	.	BDL
MAR	BDL	BDL	.	.	.	BDL
APR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	.080 <T	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	.	.	BDL
AUG	.080 <T	.	.	BDL	.	.080 <T
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
NOV	BDL	BDL	.	BDL	.	IBT
DEC	BDL	BDL	.	.	.	BDL
DICHLOROBROMOMETHANE (UG/L)				DET'N LIMIT = .050 GUIDELINE = 350 (A1+)		
JAN	10.350	13.750	.	14.300	.	13.650
FEB	8.500	13.050	.	12.400	.	12.300
MAR	8.500	13.000	.	.	.	13.400
APR	10.050 APS	12.200	.	13.100	.	12.850
MAY	9.650	12.800	.	14.650	.	12.700
JUN	8.800	12.200	.	12.450	.	13.000
JUL	8.600 RRV	15.500	.	.	.	14.900
AUG	2.350	.	.	9.900	.	9.950
SEP	7.150	13.150	.	11.700	.	11.600
OCT	5.950	12.350	.	12.650	.	12.600
NOV	3.700	10.250	.	10.600	.	IBT
DEC	5.500	10.000	.	.	.	10.150
CHLORODIBROMOMETHANE (UG/L)				DET'N LIMIT = .100 GUIDELINE = 350 (A1+)		
JAN	4.700	4.900	.	5.400	.	5.300
FEB	4.100	5.000	.	4.900	.	5.000
MAR	4.000	5.700	.	.	.	5.300
APR	6.000	5.300	.	5.800	.	5.800
MAY	4.900	5.100	.	6.200	.	5.700
JUN	4.400	5.600	.	6.200	.	5.800
JUL	4.600 RRV	7.000	.	.	.	6.700
AUG	1.100	.	.	5.800	.	5.600
SEP	3.900	5.800	.	5.000	.	5.400
OCT	3.000	5.500	.	6.300	.	5.700
NOV	1.700	4.000	.	4.600	.	IBT
DEC	2.600	3.200	.	.	.	3.600

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CHATHAM WTP 1989

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
T-CHLOROETHYLENE (UG/L)				DET'N LIMIT = .050	GUIDELINE = 10.0 (C2)	
JAN	BDL	BDL	.	BDL	.	BDL
FEB	BDL	BDL	.	BDL	.	BDL
MAR	BDL	BDL	.	.	.	BDL
APR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	BDL	.	BDL	.	BDL
JUN	BDL	.100 <T	.	BDL	.	BDL
JUL	BDL	.050 <T	.	.	.	BDL
AUG	BDL	.	.	BDL	.	BDL
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	.050 <T
NOV	BDL	BDL	.	BDL	.	IBT
DEC	BDL	BDL	.	.	.	BDL
BROMOFORM (UG/L)				DET'N LIMIT = .200	GUIDELINE = 350 (A1+)	
JAN	.400 <T	.400 <T	.	.400 <T	.	.400 <T
FEB	.400 <T	.400 <T	.	.400 <T	.	.400 <T
MAR	.400 <T	.400 <T	.	.	.	.600 <T
APR	.800 <T	1.400 <T	.	1.600 <T	.	2.600
MAY	.400 <T	BDL	.	.600 <T	.	.600 <T
JUN	.600 <T	.400 <T	.	.600 <T	.	.600 <T
JUL	.600 <T	.800 <T	.	.	.	.800 <T
AUG	BDL	.	.	.800 <T	.	.800 <T
SEP	.200 <T	.400 <T	.	.400 <T	.	.400 <T
OCT	BDL	.600 <T	.	.600 <T	.	.800 <T
NOV	.200 <T	.400 <T	.	.600 <T	.	IBT
DEC	.400 <T	.200 <T	.	.	.	.200 <T
TOTL TRIHALOMETHANES (UG/L)				DET'N LIMIT = .500	GUIDELINE = 350 (A1)	
JAN	30.150	47.750	.	51.100	.	46.050
FEB	23.000	46.150	.	42.800	.	40.200
MAR	22.500	45.400	.	.	.	49.600
APR	30.650	52.900	.	50.200	.	49.950
MAY	30.050	51.400	.	55.150	.	46.800
JUN	26.400	53.200	.	46.950	.	47.000
JUL	26.600 RRV	69.400	.	.	.	59.400
AUG	6.450	.	.	36.200	.	37.850
SEP	21.050	61.650	.	46.100	.	46.500
OCT	17.750	55.850	.	53.350	.	51.200
NOV	10.100	45.250	.	40.700	.	IBT
DEC	15.600	46.050	.	.	.	40.100

TRACE LEVELS OF TOLUENE ARE LABORATORY ARTIFACTS DERIVED FROM THE ANALYTICAL METHODOLOGY.

TRACE LEVELS OF STYRENE ARE CONSIDERED TO BE LABORATORY ARTIFACTS RESULTING FROM THE LABORATORY SHIPPING CONTAINERS.

Table 6

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BACTERIOLOGICAL			
STANDARD PLATE COUNT MEMBRANE FILTRATION	CT/ML	0	500/ML(A1)
P/A BOTTLE		0	0 (A1*)
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100mL(A1)
TOTAL COLIFORM BACKGROUND MF	CT/100ML	0	N/A
CHLOROAROMATICS			
HEXACHLOROBUTADIENE	NG/L	1.000	450. (D4)
1,2,3-TRICHLOROBENZENE	NG/L	5.000	10000 (I)
1,2,3,4-TETRACHLOROBENZENE	NG/L	1.000	10000 (I)
1,2,3,5-TETRACHLOROBENZENE	NG/L	1.000	10000 (I)
1,2,4-TRICHLOROBENZENE	NG/L	5.000	10000 (I)
1,2,4,5-TETRACHLOROBENZENE	NG/L	1.000	38000 (D4)
1,3,5-TRICHLOROBENZENE	NG/L	5.000	10000 (D4)
HEXACHLOROBENZENE	NG/L	1.0	10. (C1)
HEXACHLOROETHANE	NG/L	1.000	1900. (D4)
OCTACHLOROSTYRENE	NG/L	1.000	N/A
PENTACHLOROBENZENE	NG/L	1.000	74000 (D4)
2,3,6-TRICHLOROTOLUENE	NG/L	5.000	N/A
2,4,5-TRICHLOROTOLUENE	NG/L	5.000	N/A
2,6,A-TRICHLOROTOLUENE	NG/L	5.000	N/A
CHLOROPHENOLS			
2,3,4-TRICHLOROPHENOL	NG/L	50.	N/A
2,3,4,5-TETRACHLOROPHENOL	NG/L	50.	N/A
2,3,5,6-TETRACHLOROPHENOL	NG/L	50.	N/A
2,4,5-TRICHLOROPHENOL	NG/L	50.	2600000 (D4)
2,4,6-TRICHLOROPHENOL	NG/L	50.	2000. (B4)
PENTACHLOROPHENOL	NG/L	50.	30000. (B4)
CHEMISTRY (FLD)			
FIELD COMBINED CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD FREE CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD TOTAL CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD PH	DMSNLESS	N/A	6.5-8.5(A4)
FIELD TEMPERATURE	^{o}C	N/A	<15 ^{o}C(A1)
FIELD TURBIDITY	FTU	N/A	1.0 (A1)
CHEMISTRY (LAB)			
ALKALINITY	MG/L	.200	30-500(A4)
CALCIUM	MG/L	.100	100. (F2)
CYANIDE	MG/L	.001	.20(A1)
CHLORIDE	MG/L	.200	250. (A3)
COLOUR	TCU	.5	5.0 (A3)
CONDUCTIVITY	UMHO/CM	1.	400. (F2)
FLUORIDE	MG/L	.01	2.4 (A1)
HARDNESS	MG/L	.50	80-100(A4)
MAGNESIUM	MG/L	.05	30. (F2)

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
NITRITE	MG/L	.001	1.0 (A1)
TOTAL NITRATES	MG/L	.02	10. (A1)
NITROGEN TOTAL KJELDAHL	MG/L	.02	N/A
PH	DMSNLESS	N/A	6.5-8.5(A4)
PHOSPHORUS FIL REACT	MG/L	.0005	N/A
PHOSPHORUS TOTAL	MG/L	.002	.40(F2)
TOTAL SOLIDS	MG/L	1.	500. (A3)
TURBIDITY	FTU	.02	1.0 (A1)
METALS			
ALUMINUM	UG/L	.050	100. (A4)
ANTIMONY	UG/L	.050	10. (F3)
ARSENIC	UG/L	.050	50. (A1)
BARIUM	UG/L	.020	1000. (A1)
BORON	UG/L	.200	5000. (A1)
BERYLLIUM	UG/L	.010	0.20 (H)
CADMIUM	UG/L	.050	5.0 (A1)
COBALT	UG/L	.020	1000. (H)
CHROMIUM	UG/L	.100	50. (A1)
COPPER	UG/L	.100	1000. (A3)
IRON	UG/L	5.0	300. (A3)
MERCURY	UG/L	.01	1.0 (A1)
MANGANESE	UG/L	.050	50. (A3)
MOLYBDENUM	UG/L	.020	500. (H)
NICKEL	UG/L	.100	50. (F3)
LEAD	UG/L	.020	50. (A1)
SELENIUM	UG/L	.200	10. (A1)
SILVER	UG/L	.020	50. (A1)
STRONTIUM	UG/L	.100	2000. (H)
THALLIUM	UG/L	.010	13. (D4)
TITANIUM	UG/L	.100	N/A
URANIUM	UG/L	.020	20. (A2)
VANADIUM	UG/L	.020	100. (H)
ZINC	UG/L	.020	5000. (A3)
PHENOLICS			
PHENOLICS (UNFILTERED REACTIVE)	UG/L	.2	2.0 (A3)
PESTICIDES & PCB			
ALDRIN	NG/L	1.0	700. (A1)
AMETRINE	NG/L	50.	300000. (D3)
ATRAZINE	NG/L	50.	60000. (B3)
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700. (G)
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300. (G)
GAMMA HEXACHLOROCYCLOHEXANE(LINDANE)	NG/L	1.0	4000. (A1)
ALPHA CHLORDANE	NG/L	2.0	7000. (A1)
GAMMA CHLORDANE	NG/L	2.0	7000. (A1)
BLADEX	NG/L	100.	10000. (B3)
DIELDRIN	NG/L	2.0	700. (A1)
METHOXYCHLOR	NG/L	5.0	900000. (B1)
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000. (D4)
ENDOSULFAN 2 (THIODAN II)	NG/L	4.0	74000. (D4)
ENDRIN	NG/L	4.0	200. (A1)
ENDOSULFAN SULPHATE(THIODAN SULPHATE)	NG/L	4.0	N/A
HEPTACHLOR EPOXIDE	NG/L	1.0	3000. (A1)

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE	
HEPTACHLOR	NG/L	1.0	3000.	(A1)
METOLACHLOR	NG/L	500.	50000.	(B3)
MIREX	NG/L	5.0	N/A	
OXYCHLORDANE	NG/L	2.0	N/A	
O,P-DDT	NG/L	5.0	30000.	(A1)
PCB	NG/L	20.0	3000.	(A2)
O,P-DDD	NG/L	5.0	N/A	
PPDDE	NG/L	1.0	30000.	(A1)
PPDDT	NG/L	5.0	30000.	(A1)
ATRATONE	NG/L	50.	N/A	
ALACHLOR	NG/L	500.	35000.	(D2)
PROMETONE	NG/L	50.	52500.	(D3)
PROPAZINE	NG/L	50.	16000.	(D2)
PROMETRYNE	NG/L	50.	1000.	(B3)
SENCOR (METRIBUZIN)	NG/L	100.	80000.	(B2)
SIMAZINE	NG/L	50.	10000.	(B3)
POLYAROMATIC HYDROCARBONS				
PHENANTHRENE	NG/L	10.0	N/A	
ANTHRACENE	NG/L	1.0	N/A	
FLUORANTHENE	NG/L	20.0	42000.	(D4)
PYRENE	NG/L	20.0	N/A	
BENZO(A)ANTHRACENE	NG/L	20.0	N/A	
CHRYSENE	NG/L	50.0	N/A	
DIMETHYL BENZO(A)ANTHRACENE	NG/L	5.0	N/A	
BENZO(E)PYRENE	NG/L	50.0	N/A	
BENZO(B)FLUORANTHENE	NG/L	10.0	N/A	
PERYLENE	NG/L	10.0	N/A	
BENZO(K)FLUORANTHENE	NG/L	1.0	N/A	
BENZO(A)PYRENE	NG/L	5.0	10.	(B1)
BENZO(G,H,I)PERYLENE	NG/L	20.0	N/A	
DIBENZO(A,H)ANTHRACENE	NG/L	10.0	N/A	
INDENO(1,2,3-C,D)PYRENE	NG/L	20.0	N/A	
BENZO(B)CHRYSENE	NG/L	2.0	N/A	
CORONENE	NG/L	10.0	N/A	
SPECIFIC PESTICIDES				
TOXAPHENE	NG/L	N/A	5000.	(A1)
2,4,5-TRICHLOROBUTYRIC ACID (2,4,5-T)	NG/L	50.	200000.	(B4)
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000.	(A1)
2,4-DICHLORORPHENOXYBUTYRIC ACID	NG/L	200.	18000.	(B3)
2,4-D PROPIONIC ACID	NG/L	100.	N/A	
DICAMBA	NG/L	100.	120000.	(B1)
PICLORAM	NG/L	100.	190000.	(B3)
SILVEX (2,4,5-TP)	NG/L	50.	10000.	(A1)
DIAZINON	NG/L	20.	20000.	(B1)
DICHLOROVOS	NG/L	20.	N/A	
DURSBAN	NG/L	20.	N/A	
ETHION	NG/L	20.	35000.	(G)
GUTHION(AZINPHOSMETHYL)	NG/L	N/A	20000.	(B1)
MALATHION	NG/L	20.	190000.	(B1)
MEVINPHOS	NG/L	20.	N/A	
METHYL PARATHION	NG/L	50.	7000.	(A1)
METHYLTRITHION	NG/L	20.	N/A	
PARATHION	NG/L	20.	50000.	(B1)

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE	
PHORATE (THIMET)	NG/L	20.	2000.	(B3)
RELDAN	NG/L	20.	N/A	
RONNEL	NG/L	20.	N/A	
AMINOCARB	NG/L	N/A	N/A	
BENONYL	NG/L	N/A	N/A	
BUX (METALKAMATE)	NG/L	2000.	N/A	
CARBOFURAN	NG/L	2000.	90000.	(B1)
CICP (CHLORPROPHAM)	NG/L	2000.	350000.	(G)
DIALLATE	NG/L	2000.	30000.	(H)
EPTAM	NG/L	2000.	N/A	
IPC	NG/L	2000.	N/A	
PROPOXUR (BAYGON)	NG/L	2000.	90000.	(G)
SEVIN (CARBARYL)	NG/L	200.	90000.	(B1)
SUTAN (BUTYLATE)	NG/L	2000.	245000.	(D3)
VOLATILES				
BENZENE	UG/L	.050	5.0	(B1)
TOLUENE	UG/L	.050	24.0	(B4)
ETHYLBENZENE	UG/L	.050	2.4	(B4)
PARA-XYLENE	UG/L	.100	300.	(B4)
META-XYLENE	UG/L	.100	300.	(B4)
ORTHO-XYLENE	UG/L	.050	300.	(B4)
1,1-DICHLOROETHYLENE	UG/L	.100	7.0	(D1)
ETHLYENE DIBROMIDE	UG/L	.05	.05	G)
METHYLENE CHLORIDE	UG/L	.500	50.	(B1)
TRANS-1,2-DICHLOROETHYLENE	UG/L	.100	70.	(D5)
1,1-DICHLOROETHANE	UG/L	.100	N/A	
CHLOROFORM	UG/L	.100	350.	(A1+)
1,1,1-TRICHLOROETHANE	UG/L	.020	200.	(D1)
1,2-DICHLOROETHANE	UG/L	.050	5.0	(D1)
CARBON TETRACHLORIDE	UG/L	.200	5.0	(B1)
1,2-DICHLOROPROPANE	UG/L	.050	6.0	(D5)
TRICHLOROETHYLENE	UG/L	.100	50.	(B1)
DICHLOROBROMOMETHANE	UG/L	.050	350.	(A1+)
1,1,2-TRICHLOROETHANE	UG/L	.050	.60	(D4)
CHLORODIBROMOMETHANE	UG/L	.100	350.	(A1+)
TETRACHLOROETHYLENE	UG/L	.050	10.0	(C2)
BROMOFORM	UG/L	.200	350.	(A1+)
1,1,2,2-TETRACHLOROETHANE	UG/L	.050	0.17	(D4)
CHLOROBENZENE	UG/L	.100	60.	(D5)
1,4-DICHLOROBENZENE	UG/L	.100	1.0	(B4)
1,3-DICHLOROBENZENE	UG/L	.100	130.	(G)
1,2-DICHLOROBENZENE	UG/L	.050	3.0	(B4)
TRIFLUOROCHLOROTOLUENE	UG/L	.100	N/A	
TOTAL TRIHALOMETHANES	UG/L	.500	350.	(A1)
STYRENE	UG/L	.05	140.	(D5)

Appendix A

DRINKING WATER SURVEILLANCE PROGRAM

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality,
- a flagging mechanism for 'Objective' exceedence,
- a definition of contaminant levels and trends,
- a comprehensive background for remedial action,
- a framework for assessment of new contaminants,
- and an indication of treatment efficiency of plant processes.

Program

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario. Currently, 44 plants are being monitored. Water supply locations have been prioritized for surveillance based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit. It is estimated that after 4 years of operation, the program will be monitoring 90 locations.

A major goal of the program is to collect valid water quality data in context with plant operational characteristics at the time of sampling. As soon as sufficient data have been accumulated and analysed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling in order to acquire complete plant process and distribution system details and to designate (and retrofit if necessary) all sampling systems and locations. This ensures that the sampled water is a reflection of the water itself.

Samples are taken of the raw (ambient water) and the treated water at the treatment plant and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled.

Sampling is carried out by operational personnel who have been trained in the applicable procedures.

Comprehensive standardized procedures and Field Test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". All laboratory analyses are carried out by the MOE Laboratory Services Branch.

Data Reporting Mechanism

When the analytical results are transferred from the MOE laboratory into the DWSP system, printouts of the completed analyses are sent to the MOE District Officer, the appropriate operational staff and are also retained by the DWSP co-ordinator.

DWSP INPUTS AND OUTPUTS

The DWSP INPUTS and OUTPUTS are illustrated in Fig. 1.

PROGRAM INPUTS

PLANT AND DISTRIBUTION SYSTEM DESCRIPTION

The system description includes plant specific non-analytical information acquired through a questionnaire and an initial plant

visit. During the initial assessment of the plant and distribution system, the questionnaire content is verified and missing information added. It is intended that all data be kept current with scheduled annual updates.

The PLANT and DISTRIBUTION SYSTEM DESCRIPTION consists of the following seven components.

1. Process component inventory

All physical and chemical processes that the water is subjected to, from the intake pipe to the consumers' tap (where possible), are documented. These include: process type, general description of physical structures, material types, sizes, and retention time for each process within the plant. The processes may be as simple as transmission or as complex as carbon adsorption.

2. Treatment chemicals

Chemicals used in the treatment processes, their function, application point, supplier and brand-name are recorded. The chemical dosages applied on the day of sampling are recorded in DWSP.

3. Process control measurements

Documentation of in-plant monitoring of process parameters (turbidity, chlorine residuals, pH, aluminum residuals) including methods used, monitoring locations and frequency is contained in

this section. In-plant monitoring results are generally not retained in DWSP but are retained by the Water Treatment Plant.

4. Design flow and retention time

The hydraulic capacity, designed and actual, is noted here. Retention time (the time that a block of water is retained in the plant) is also noted. The maximum, minimum and average flow, as well as a record of the flow rate on the day of sampling, are recorded in DWSP.

5. Distribution system description

This area includes the storage and transmission characteristics of the distribution system after the water leaves the plant.

6. Sampling system

Each plant is assessed for its adequacy in terms of the sampling of bacteriological, organic and inorganic parameters. The prime considerations in the assessment and design of the sampling system are:

i/ the sample is an accurate representation of the actual water condition, eg. raw water has had no chemical treatment;

ii/ the water being sampled is not being modified by the sampling system;

iii/ the sample tap must be in a clean area of the plant,

preferably a lab area;

iv/ the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself.

The sampling system documentation includes: origin of the water; date sampling was initiated; size, length and material type (intake, discharge and tap); pump characteristics (model, type, capacity); and flow rate.

7. People

This section contains the names, addresses and phone numbers of current plant management and operational staff, distribution system management and operational staff, Medical Officer of Health and appropriate Ministry of Environment personnel associated with the plant.

FIELD DATA

The second major input to DWSP is field data.

Field data is collected at the plant and from the distribution system sites on the day of sampling. The field data consists of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used,

dosages, flow and retention time on the day of sampling as well as monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free, combined and total), temperature and pH. These parameters are analysed according to standardized DWSP protocols to allow for interplant comparison.

LABORATORY ANALYTICAL DATA

The third major input to DWSP is Laboratory Analytical Data.

Samples gathered from the raw, treated and distribution sampling sites are analyzed for the presence of approximately 180 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. The parameters measured may have health or aesthetic implications when present in drinking water. Many of the parameters may be used in the treatment process or may be treatment by-products. Due to the nature of certain analytical instruments, parameters may be measured in a "scan" producing some results for parameters that are not on the DWSP priority list but which may be of interest. The majority of the parameters are measured on a routine basis. Those that are technically more difficult and/or costly to analyse, however, are done less frequently. These include Specific Pesticides and Chlorophenols.

Although the parameter list is extensive, additional parameters with the potential to cause health or aesthetic related problems

may be added provided reliable analytical and sampling methods exist.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change, notation will be made and intercomparison data documented.

PARAMETER REFERENCE INFORMATION

The fourth major input to DWSP is Parameter Reference Information. This is a catalogue of information for each substance analysed on DWSP. It includes parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses. The Parameter Reference Information is computerized and can be accessed through the Query function of the DWSP database.

An example is shown in figure 2.

A written copy (hard version) of the Parameter Reference Information will be available in the near future and is a new and sophisticated enhancement to the DWSP.

PROGRAM OUTPUTS

There are four major program outputs: Query, Action Alert, Report Generation and the Annual Report.

QUERY

All DWSP information is easily accessed through the Query function. Therefore, anything from addresses of plant personnel to complete water quality information for a plant's water supply is instantly available. The DWSP computer system makes relatively complex inquiries manageable. A personal password allowing access into the DWSP query mode in all MOE offices is being developed by the DWSP group.

ACTION ALERTS

Drinking Water quality in Ontario is evaluated against provincial objectives as outlined in the publication Ontario Drinking Water Objectives (ISBN 0-7729-2725-1 revised 1983). This publication contains health-related Maximum Acceptable Concentrations for thirty substances. Should the reported level of a substance in treated water exceed the Ontario Drinking Water Objective, an "Action Alert" requiring resampling and confirmation is issued. This assures that operational staff, health authorities and the public are notified as soon as possible the confirmation of an exceedance and remedial action taken. This report supplies a history of the occurrence of past exceedences at the plant plus a historical summary on the parameter of concern.

In the absence of Ontario Drinking Water Objectives, other agency guidelines, which are documented in the Parameter Reference

Information, may be used. If these guidelines are exceeded, the results are flagged and evaluated by DWSP personnel. An "Action Alert" will be issued if warranted.

REPORT GENERATION

Custom reports can be generated from DWSP to meet the needs of the regions and to respond to public requests.

ANNUAL REPORTS

It is the practice of DWSP to produce an annual report containing analytical data along with companion plant information.

FIG. 1

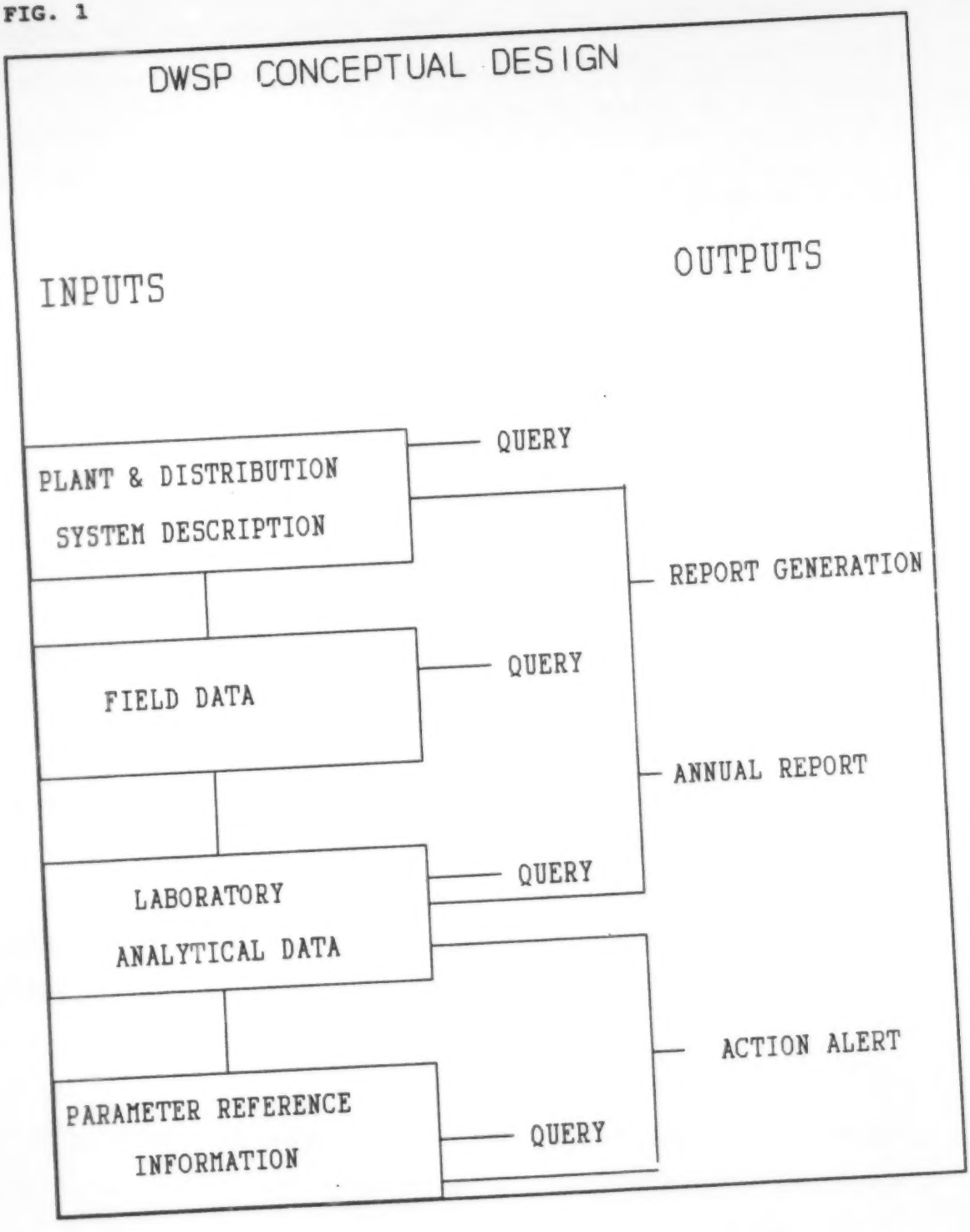
DWSP CONCEPTUAL DESIGN
INPUTS
OUTPUTS
PLANT & DISTRIBUTION SYSTEM DESCRIPTION
FIELD DATA
LABORATORY ANALYTICAL DATA
PARAMETER REFERENCE INFORMATION
QUERY
QUERY
QUERY
QUERY
REPORT GENERATION
ANNUAL REPORT
ACTION ALERT

FIG.2

MOE - DRINKING WATER ASSESSMENT PROGRAM (DWSP)

(B2001P) PARAMETER REFERENCE
BENZENE

SOURCE	FROM	TO	METHOD	TARG	UNIT	NOTE
EPA	C 86/04		NOMETH	.00	063000 UG/L	RMCL
EPAA	C 80/11		NOMETH	6.60	063000 UG/L	
FERC	C 84/05		NOMETH	1.00	063000 UG/L	
WHO	C 84/01		NOMETH	10.00	064000 UG/L	

DESCRIPTION: NAME: BENZENE
CAS#: 71432
MOLECULAR FORMULAE: C_6H_6
DETECTION LIMIT: (FOR METHOD POCODO) 0.05 UG/L
SYNONYMS: BENZOLE, COAL NAPHTHA, CARBON OIL (27), CYCLOHEXATRIENE (41)
CHARACTERISTICS: COLOURLESS TO LIGHT YELLOW, MOBILE, NON-POLAR LIQUID, OF HIGHLY REFRACTIVE NATURE, AROMATIC, VAPOURS BURN WITH SMOKING FLAME (30)
PROPERTIES:
SOLUBILITY IN WATER: 1780-1800 MG/L AT 25 DEG C (41)
THRESHOLD ODOUR: NO DATA
THRESHOLD TASTE: 0.5 MG/L IN WATER (39)
ENVIRONMENTAL FATE: MAY BIOACCUMUALTE IN LIVING ORGANISMS, APPEARS TO BIOACCUMULATE IN ANIMAL TISSUES THAT EXHIBIT HIGH LIPID CONTENT OR ARE MAJOR METABOLIC SITES (LIVER, BRAIN), SMALL QUANITIES EVAPORATE FROM SOIL OR DEGRADE QUICKLY
SOURCES: PETROLEUM REFINING, SOLVENT RECOVERY, COAL TAR DISTILLATION, FOOD PROCESSING, TANNING.
USES: PREPERATION OF ETHYL BENZENE USED AS A STYRENE MONOMER, DETERGENTS, NYLON, AS INTERMEDIATE IN PESTICIDE PRODUCTION, SOLVENT IN RUBBER INDUSTRY, DEGREASING AND CLEANSING AGENT, GASOLINE.
TOXICITY: RATING 4 (VERY TOXIC); ACUTE - IRRITATES MUCOUS MEMBRANES, SYMPTONS INCLUDE RESTLESSNESS, CONVULSIONS, DEPRESSION, RESPIRATORY FAILURE; CHRONIC - ANEMIA AND LEUKEMIA (45).
CARINOGENICITY: HUMAN CARCINOGEN AND MUTAGEN
REMOVAL: GAC ADSORPTION, PRECIPITATION WITH ALUM FOLLOWED BY SEDIMENTATION, COAGULATION AND FLOCCULATION, SOLVENT EXTRACTION, OXIDATION (41).
MOLECULAR WEIGHT: 78.12 GRAMS
MELTING POINT: 5.5 DEGREES C (27)
BOILING POINT: 80.1 DEGREES C (27)
SPECIFIC GRAVITY: 0.879 AT 20 DEGREES C (27)
VAPOUR PRESSURE: 100 MM AT 26.1 DEGREES C
HENRY'S LAW CONSTANT: 0.00555 ATM M_3/MOLE
LOG OCT./WATER PAR.COEFF: K=1.0 1/N=1.6 R=.97 PH=5.3

Appendix B

DWSP SAMPLING GUIDELINE

i) RAW and TREATED at PLANT

General Chemistry	-500 mL clear plastic bottle -rinse bottle with sample three times and discard water -fill to line
Bacti	-250 mL clear glass bottle with white seal on cap -do <u>not</u> rinse bottle; preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL clear plastic bottle with white lid -rinse bottle and cap three times, discard -fill to line -add 10 drops nitric acid (**Caution:** HNO_3 is corrosive)
Volatiles (OPOPUP)	-250 mL clear glass bottle -do <u>not</u> rinse bottle -tilt bottle when filling -fill bottle completely; there should be no air bubbles.
Organic (OWOC),(OWTRI),(OAPAHX)	-1 liter brown glass bottle per scan -do <u>not</u> rinse bottle -fill to approx. 1" from top -when 'special pesticides' are requested three extra bottles per sample must be submitted
Cyanide	-500 mL clear plastic bottle -do <u>not</u> rinse bottle -fill to approx. 1" from top -add 10 drops sodium hydroxide (**Caution:** NaOH is corrosive)

Mercury	-250 mL clear glass bottle -rinse bottle and cap three times, discard then fill to top of label -add 20 drops each nitric acid and potassium dichromate (**Caution:** HNO_3 and $K_2Cr_2O_7$ corrosive)
Phenols	-250 mL clear glass bottle -do <u>not</u> rinse bottle -fill to top of label as marked

<u>Steps</u>

1. Let cold water tap run for several minutes.
2. Record time in submission sheet.
3. Record teperature on submission sheet.
4. Fill up all bottles as per instructions.
5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry	-500 mL clear palstic bottle -rinse bottle with sample three times and discard -fill to line
Metals	-500 mL clear plastic bottle with white lid -rinse bottle and cap three times, discard -fill to line -add 10 drops nitric acid (**Caution:** HNO_3 is corrosive)

Steps:

1. Record time on submission sheet.
2. Place bucket under tap and open cold water.
3. Fill to predetermined volume.
4. After mixing the water, record the temperature on the submission sheet.
5. Fill general chemistry and metals bottles.
6. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

iii) Distribution Samples (free flow)

General Chemistry	-500 mL clear plastic bottle -rinse bottle with sample three times and discard water -fill to line
Bacti	-250 mL clear glass bottle with white seal on cap -do <u>not</u> rinse bottle; preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL clear plastic bottle with white lid -rinse bottle and cap three times, discard -fill to line -add 10 drops nitric acid (**Caution:** HNO_3 is corrosive)
Volatiles (OPOPUP)	-250 mL clear glass bottle -do <u>not</u> rinse bottle; preservative has been added -tilt bottle when filling -fill bottle completely; there should be no air bubbles
Organic (OWOC),(OWTRI)	-1 liter brown glass bottle per scan -do <u>not</u> rinse bottle: preservative has been added -fill to approx. 1" from top
Cyanide	-500 mL clear plastic bottle -do <u>not</u> rinse bottle: preservative has been added -fill to approx. 1" from top -add 10 drops sodium hydroxide (**Caution:** NaOH is corrosive)
Mercury	-250 mL clear glass bottle -rinse bottle and cap three times, discard then fill to top of label -add 20 drops each nitric acid and potassium dichromate (**Caution:** HNO_3 and $K_2Cr_2O_7$ corrosive)

Steps:

1. Record time on submission sheet.
2. Let cold water flow for five minutes.
3. Record temperature on submission sheet.
4. Fill all bottles as per instructions.
5. Record chlorine residuals (free, combined and total), tubidity and pH on submission sheet.